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DECEMBER

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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Colonel, United States Army Dental Corps
President Elect of the American Dental Association

UNIV. OF MICH.

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VOL. 16 DECEMBER, 1929 No. 12

Original Communications

PRESIDENTIAL ADDRESS*

By PERCY R. HOWE, A.B., D.D.S., D.Sc., Boston, Mass.

I ASK your indulgence in departing somewhat from the customary form of presidential address. Instead of dealing with concrete society affairs, I have a few words to say on the fundamentals which underlie dental advancement. Achievement is the goal toward which all the resources of this organization are directed. To us, progress has a real meaning. As a profession, we are making progress in that we are becoming scientifically minded; certainly we are open minded and have a thirst for definite knowledge. Unhampered by traditions or archaic beliefs, we have an independence of thought which makes for rapid but certain progress.

It requires no stretch of the imagination to realize that the old days are passed. We no longer control moisture by napkins, file coins for amalgam, shape our own instruments by hand, extirpate pulps by the heroic measure of driving into them a sharpened stick wet with creosote.

Today, our offices are replete with devices for rapidity, effectiveness, accuracy and painlessness of procedure. We observe the rules of asepsis; we read the condition of hidden bone.

The pride of earlier days was manipulative skill. The pride of today is that we keep abreast of the developments of science.

To Miller more than to anyone else is credit due for the introduction of scientific experimental methods into dentistry. Working in the inspiring atmosphere of Koch's laboratory, in those interesting days when Pasteur's discoveries on the cause of infectious disease had fired medical science with enthusiasm, Miller attacked the problem of dental caries. He entered into a comprehensive study of the micro-organisms of the mouth, and a review of his work shows a familiarity with

*Read at the First General Meeting of the Seventy-First Annual Session of the American Dental Association, Washington, D. C., Oct. 8, 1929.

the oral flora which is astonishing, considering the primitive state of bacterial cultivation then extant.

His search for a specific causative organism of caries was not rewarded. He then fell back on Pasteur's earlier work on fermentation, and after a study of considerable magnitude, evolved the chemicoparasitic theory which bears his name.

While recent research casts doubt on the validity of some of his conclusions, his performance, considering the disadvantages of his day, was remarkable.

Nor should we forget the many other investigators who also did their part to place dentistry on a scientific footing through accurate study of the histology and embryology of the teeth. So well done was this work that little remains to be added to it.

Elementary, fragmentary, limited as was this early work, it marked the awakening of the scientific spirit in dentistry and its entrance into that flood of science which everywhere prevails and which forms the basis of all real progress.

The essential differences between that epoch of science and this of today are two. Practically all investigation was then carried out on teeth removed from their vital connections, while recent research has been conducted on living animals with the teeth *in situ*.

In the second place, dental problems have now been approached from many angles. The physiologist, anthropologist, pathologist, bacteriologist, dietitian, have all added their quota of investigation, and what appeared to be dissociated and unique phenomena are rapidly being welded into a coordinate whole. Modern biologic study has been most fruitful. No longer do we regard vital forces as negligible, or the teeth as inert masses of carbonate and phosphate of lime to be acted on solely by external factors. We believe they are subject to internal changes hitherto unsuspected, and we feel that the principles which apply to other calcified structures are applicable here.

Our investigation has carried us beyond the actual field of dentistry into that of general biology. The results already obtained have enlisted the interest of many investigators and have proved to be of fundamental importance in tissue changes of a wide range.

Through the progressiveness of some of our men, the whole field of our research has been critically examined by scientists of note, and the attempt will be made to direct our future efforts along lines that will measure up to the requirements of modern research standards. Too often, theoretical speculation has carried us far beyond what was warranted by experimental facts, and what were assumed to be interesting discoveries have proved to be fetishes of the hour. The great body of clinicians whose only contact with the research laboratories is through the dental magazines and occasional lectures can have no certain method of determining the precise value to dentistry of the scientific data which are gradually accumulating; nor can they always be expected to distinguish between the scientific and the pseudoscientific. It is for this reason that we feel that all our theories should be scrutinized by men of the highest standing, for thus a solid and substantial basis for real progress will be provided.

The profession, rightly, does not accept too readily ingenious speculations, but more and more demands demonstrable proofs. Individually and collectively, we are becoming scientifically minded. Our research indicates that we have a full program ahead, going into the province of medicine and public health, especially

as it relates to children. We must call attention to the fact that all diseases are not crises, but that these are the manifest culmination of degeneracy changes which, while leaving their impress on the teeth, are in reality of more fundamental significance.

We are pioneering. We have no traditions to bind us; we dare to think so long as we can prove our results. As never before, our profession is in the straight line of progress. We have opened a door. We do not know where it leads, except that, in general, it is in the right direction. "Nature does not reveal all her secrets at once," said Seneca. "We imagine that we are initiated into her mysteries; we are, as yet, but hanging around her outer courts."

NORMAL AND PATHOLOGIC POCKET FORMATION*

By HERMANN BECKS, M.D., D.D.S., San Francisco, Calif.

DURING the past few years, several attempts have been made, in a more or less scientific manner, to find the cause of pathologic changes in the region of the oral cavity. It is to be observed, however, that questions of fundamental importance to the study of this subject have been overlooked. Without an understanding of these questions, the conclusions reached in these investigations will be of no value either to science or to practice. In a recent article, Orban[1] emphasizes the fact that many authors working at the present time either ignore or utilize in only a very slight degree the results of foreign investigators. The pathologic changes in the tissues surrounding the teeth have been studied without a thorough comprehension of normal conditions, and until the normal conditions are understood, it is not possible to make an accurate statement with regard to the pathologic conditions. But there are great differences of opinion also as to what may be considered "normal." Therefore, the first task should be to clarify, from a morphologic standpoint, the question as to how a normal pocket (gingival sulcus) may be formed. Furthermore, that opinions at the present time vary as to what constitutes normal or pathologic conditions of the tissue surrounding the teeth may be seen from the following:

Some authors consider the condition normal when the bottom of the pocket is located at the junction of the middle and cervical third of the anatomic crown; others consider the beginning of the epithelium proliferation along the cementum as a pathologic change. Most inves-

*From the Dental College and George Williams Hooper Foundation for Medical Research, University of California.

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*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-First Annual Session of the American Dental Association, Washington, D. C., Oct. 10, 1929.

1. Orban, Balint: The Gingival Crevice, J. A. D. A., 16: 1206 (July) 1929.

tigators describe the change as normal or pathologic according to the speed with which the change in the epithelium at the surface of the tooth takes place. Other investigators consider as "normal" conditions in which the free margin of the gum is on a level with the cemento-enamel junction. Thus, we see that all of these questions, which are the foundation upon which we work, must be clearly understood before we enter into the realm of pathology; and it is therefore important and desirable to reinvestigate the relationship of the epithelium to the tooth.

In the study of all these questions, human material has been used (sixty-two jaws). In order to test the conclusions drawn from the study of human material, it was necessary to examine a large quantity of animal material as well. This consisted of specimens from monkeys, dogs, pigs, rats, rabbits, skunks, coyotes and cats. Many of these animals were killed in the course of experimentation on diets, the results of which will be published in the near future.

The terms "paradentosis," "paradentitis" and "paradentium"[2] have been used in this paper in order to afford a better understanding of the pathologic conditions present in the mouth. The nomenclature employed in the Vienna school has also been used, as follows:

Free margin of the gum: the junction of the pocket epithelium with the mouth epithelium.

Pocket epithelium: that epithelium which lies between the free margin of the gum and the bottom of the pocket.

Bottom of the pocket: the point where the pocket epithelium is attached to the tooth.

Epithelial attachment: that part of the epithelium which is connected organically with the surface of the tooth.

We are all familiar with the histologic picture of the different pathologic changes occurring in the paradentium, but the cause of these changes is not clearly understood at the present time. The study of the morphologic aspect of the problem will perhaps bring us closer to the etiology of paradentosis and we should not overlook the importance of biochemistry in this connection.[2]

NORMAL POCKET FORMATION AND EPITHELIAL ATTACHMENT

If the terms "pocket" and "pocket formation" are to be used, there must be a distinct understanding of both normal and pathologic conditions. Heretofore, the shallow groove formed by the gum tissue adjacent to the tooth has been known as the gingival sulcus or gingival crevice. In opposition to this term, "pathologic pocket" or, quite generally, just "pocket" has been used; that is, the term "pocket" indicated a deepening of the sulcus, which was considered a pathologic condition. In order to recognize "pathologic" pockets, it is necessary first to know what "normal" pockets are. The terms "normal and pathologic sulcus" (crevice) might be used; but since a sulcus (crevice) which could be considered pathologic would no longer be a sulcus but a pocket, the depth of which may vary, it would be more desirable to use the term "normal pocket" and understand by this that the gingival sulcus is meant. The term "physiologic pocket" has been used by other authors to indicate the gingival sulcus. There is both a normal and a pathologic physiology, and since these authors desire to convey by the term "physiologic pocket" a normal anatomic condition, it should be possible to eliminate this term and replace it with

2. Becks, Hermann: General Aspects in Pyorrhea Research, Pac. Dent. Gaz., 37: 259 (May) 1929.

"normal pocket"; in other words, the gingival sulcus (crevice) or the physiologic pocket may be called the normal pocket.

I take cognizance of the fact that it is extremely difficult to define "normal." In many borderline cases, it is practically impossible to determine whether the condition can still be described as normal or whether the pathologic process has already begun. In the first part of this paper, these borderline cases will not be considered. Attention will be given only to the process which takes place without pathologic change during and after the eruption of the tip of the tooth through the mouth epithelium.

Gottlieb,[3] who deserves due credit for throwing new light upon the question of pocket formation, believes that the "cuticula dentis" loosens from the underlying cells of the outer enamel epithelium during eruption in order to retain its connection with the enamel. With the eruption of the teeth, still larger parts of

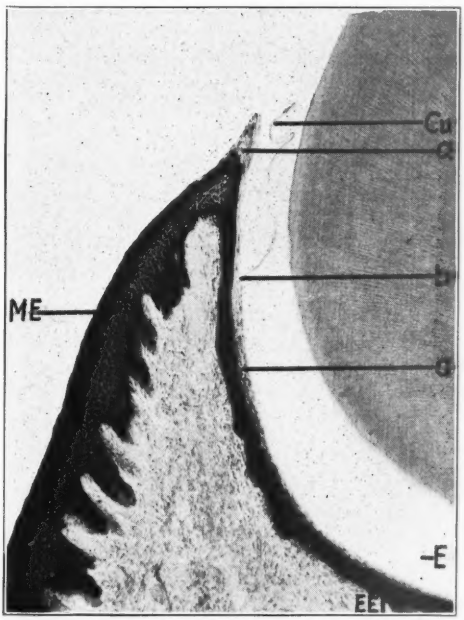


Fig. 1.—Eruption of the first right lower incisor, buccal side, in a dog. The fusion of the mouth epithelium with the enamel epithelium has just taken place and no pocket (sulcus) has yet been formed. The cuticle, which is the product of change of the former ameloblastic layer, has become loosened from the superficial degenerated layer of the enamel epithelium during preparation. *a*, degenerated layer of epithelium; *b*, lowest point of artefact; *E*, enamel; *EE*, enamel epithelium; *ME*, mouth epithelium. (Leitz: obj. 16; eyep. 4; × 42.)

3. Gottlieb, Bernhard: Zur Biologie des Epithelansatzes und des Alveolarrandes, Deutsch. Zahnärztl. Wchnschr., 25: 434, No. 35, 1922; Der Epithelansatz am Zahn, Deutsch. Monatschr. f. Zahnheilk., 39: 142, No. 5, 1921.

superficial hornified outer enamel epithelium loosen, until the tooth has reached the line of occlusion. At this time, the bottom of the pocket is situated at the point of detachment. In other words, Gottlieb believes that the normal pocket is formed by a simple separation of the enamel epithelium from the cuticula dentis.

Interpreting Figures 1 and 2 by Gottlieb's theories, the pocket formation would take place between the cuticle *(Cu)* and the light superficial layer of the enamel epithelium. This manner of formation did not seem to coincide with the conditions as found in these studies. Figures 1 and 2 are similar to Figure 16 in Orban and Köhler's[4] article. In this drawing, they illustrate on the tooth of a dog a simple loosening of the epithelium from the enamel membrane. This loosening, which is shown at *T*, is, in my opinion, nothing more nor less than an artefact, which can be more easily seen in Figures 1 and 2.

In Figure 1, the loosening of the epithelium has taken place as far as *b*, but this was caused by the preparation of the section. This may easily be explained by the fact that the superficial layer of the

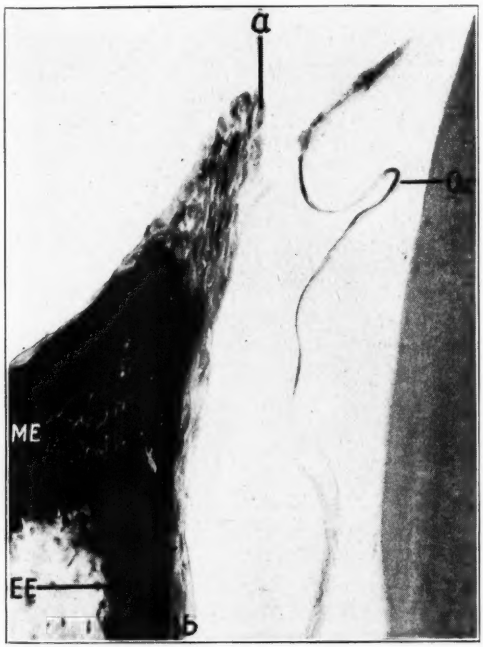


Fig. 2.—Magnification of Figure 1. Necrotic epithelial layer before desquamation (*a*). The degenerating superficial enamel epithelium is shown at *b*. There is no pocket formation. (Leitz: obj. 4; eyep. 4; × 140.)

4. Orban, Balint, and Köhler, J.: Die physiologische Zahnfleischtasche, Epithelansatz und Epitheltiefenwucherung, Ztschr. f. Stomatol., 22: 353, No. 6, 1924.

enamel epithelium shows a high degree of degeneration (layer *a*). Therefore, the connection is unlike that between the enamel epithelium and the cuticle.

The cuticula dentis, as observed in human material, has not been formed in this specimen, nor has it been found in any of the specimens of material from dogs.

not heretofore recognized. Weski,[5] who followed Gottlieb in these studies, found that the normal pocket (gingival sulcus) represents an intra-epithelial split, a retro-cuticular fissure of the epithelium. At the time of eruption, the mouth epithelium is pierced by the tooth and a split appears in the epithelial layer. The major portion of the cells keep their connection

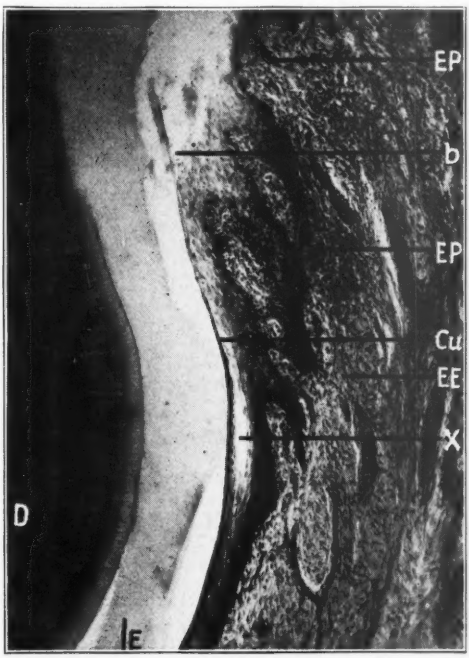


Fig. 3.—Eruption of the left upper first bicuspid, buccal side, in a dog. The crevice at *x* represents an intra-epithelial split caused by preparation. The bottom of the pocket is at *b*. There is proliferation of the mouth epithelium (*EP*) and enamel epithelium (*EE*). From *b* apically, the enamel epithelium is still organically connected with the enamel (epithelial attachment). *Cu*, cuticle; *D*, dentin; *E*, enamel. (Leitz: obj. 16; eyep. 4; × 50.)

The cuticle (*Cu*) represents the product of change of the former ameloblastic layer. The normal pocket, as we shall see in other sections, is formed in a manner

5. Weski, O.: Die chronischen marginalen Entzündungen des Alveolarfortsatzes mit besonderer Berücksichtigung der Alveolarpyorrhoe, Vrtljschr. f. Zahnheilk., 37, No. 1, 1921; 28, No. 1, 1922.

with the basal layer of the epithelium, while a few cells remain with the cuticle. The depth of this split after eruption is normally 1.5 mm. These conclusions have been concurred in by Euler,[6] as a result of his study of this question.

It appears, therefore, that the conclusions of Gottlieb and Weski are in direct opposition to each other. While Gottlieb believes that normal pocket formation is the result of a loosening of the superficial, hornified enamel epithelial layer, epithelial layer are the result of the methods of preparation of the sections. Intra-epithelial splitting is observed alike in man and in animal, but may be ascribed to traumatic and inflammatory causes.

When we compare this condition more closely with human material, we see that we must distinguish clearly between the epithelium of the mouth and the enamel epithelium. According to my opinion, the importance of this distinction has been overlooked.

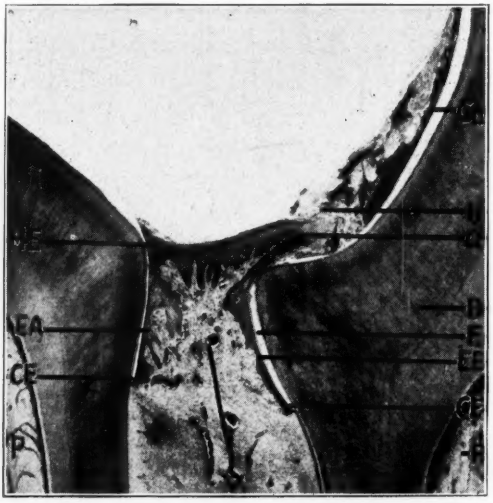


Fig. 4.—Eruption of first and second upper right bicuspids, in a dog; junction of the enamel epithelium (*ℰE*) with the mouth epithelium (*ME*) at *a*. *CE*, cemento-enamel junction; *Cu*, cuticle; *D*, dentin; *E*, enamel; *EA*, epithelial attachment; *H*, necrotic and hornified mass and débris; *P*, pulp; *V*, vessel. (Leitz: micros. 42; × 22.)

Weski believes that it is an intra-epithelial split, as shown in Figure 3. Most of the investigators who followed these men have agreed with Gottlieb, while Weski's observations are very generally questioned. It is believed that splits in the

In Figures 4 and 5, we see that the epithelium of the mouth fuses with the enamel epithelium; in other words, we are dealing with two different layers of epithelium, both of which may have the tendency to proliferation. The examination of a great number of sections led to the conclusion that, without exception, when the epithelium of the mouth be-

6. Euler, H.: Der Epithelansatz in neuerer Beleuchtung, Vrtljschr. f. Zahnheilk., 1923, No. 1.

comes fused with the enamel epithelium and the removal of necrotic cell remnants follows, the enamel epithelium degenerates progressively.

In Figure 6, we see plainly that a certain portion of the enamel epithelium is covered by the epithelium of the mouth, and the enamel epithelium on its surface shows degeneration and hornification in its whole length and breadth, which indicates that, in man, we are not dealing with a hornification of the superficial layer of the united enamel epithelium alone (Gottlieb, Orban) but also with a slow degeneration of the enamel epithelium, especially at the junction of the mouth and enamel epithelium.

In Figure 6, the bottom of the pocket is situated at *b*, where a distinct reduction of the enamel epithelium is visible. The mouth epithelium must be distinguished in this case from the enamel epithelium, which has proliferated along the cementum. The normal pocket here has not been formed by a simple loosening of the cuticle from the enamel epithelium, but by a degenerative process and necrosis of those parts of the enamel epithelium adjacent to the mouth epithelium and the cuticle through the disappearance of the enamel epithelium which was between them.

It is difficult to tell what takes place first, whether the degeneration of the enamel epithelium or the growing down of the mouth epithelium, but it is most logical to suppose that there first takes place the destruction of the enamel epithelium which, having fulfilled its function, is replaced by the epithelium of the mouth and little by little covered entirely by it; for we know that the epithelium possesses the property of covering over an injured area on the surface. On the other hand, it may be possible that the growing mouth epithelium shuts off the

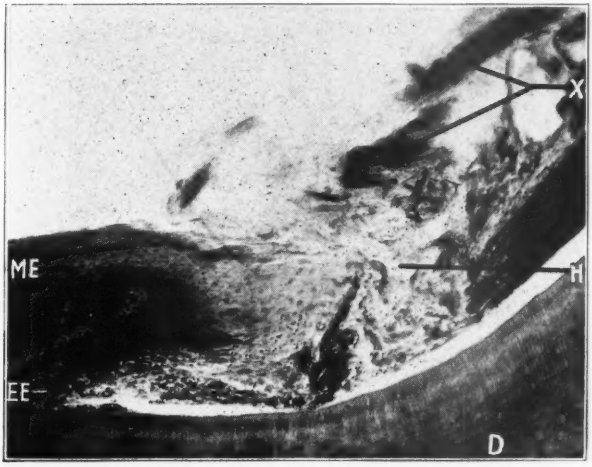


Fig. 5.—Magnification of Figure 4. Junction of the enamel epithelium (*EE*) and the mouth epithelium (*ME*); degenerated and hornified epithelium (*H*) before desquamation on the top of the erupting tooth. *D*, dentin; *X*, débris. (Leitz: obj. 4; eyep. 4; × 155.)

nourishment of the enamel epithelium so that it becomes necrotic. Even if this process cannot be plainly observed in all sections, we still find evidence of it. Thus, Figure 7 compares the enamel epithelium on the labial side of a continuously growing incisor of a rat with the same condition found in Figure 6. The furthermost extension of the mouth epithelium lies in close apposition to the degenerating enamel epithelium. The tear at *a* gives the direction in which the separation of the tooth from its environment takes place during its continuous eruption.

I desire to emphasize that the enamel epithelium *(EE)* is sharply distinguished from the mouth epithelium *(ME)* in this picture.

In Figure 8, which shows pocket for-

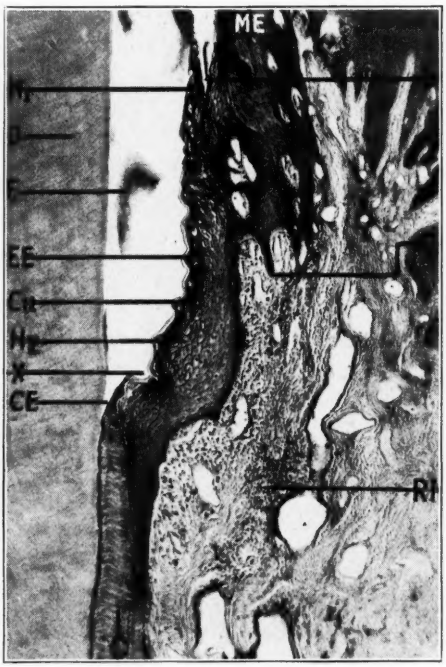


Fig. 6.—Cross-section in which the mouth epithelium (*ME*) has grown downward just behind the enamel epithelium (*EE*). The lowest point is at *c*. The cells of the enamel epithelium show inflation and necrosis (H_2). Hornification and desquamation of enamel epithelium is seen at H_1. Between epithelium and enamel (*E*), which disappeared by decalcification, the hornified "cuticula dentis" (*Cu*) is seen. Its formation is continued after downward growth of "enamel epithelium" on the surface of the cementum. The bottom of the pocket, at *b*, and not at *x*, is formed on one side by the inner surface of mouth epithelium and on the other side by the degenerated and hornified enamel epithelium (cuticle). *C*, cementum; *CE*, cemento-enamel junction; *D*, dentin, *RI*, round-cell infiltration. (Leitz: obj. 16. eyep. 4; × 40.)

mation in a pig's mouth, we see plainly the superficial hornification *(H)* of the growing mouth epithelium, which shows the direction in which the further deepening of the pocket will occur. The pocket is bordered by the remaining enamel epithelium, which is connected as an enamel membrane with the teeth. Toward the apex, the enamel membrane can be traced into the enamel epithelium, which is covered by the mouth epithelium and shows extensive flattening and degeneration.

Where is the pocket formed and where is its bottom? It is not so difficult to see this in Figures 6, 7 and 8. If Gottlieb considered the deepest point of separation of the cuticula dentis from the united enamel epithelium as the bottom of the pocket, I will say that according to these pictures and those shown by Gottlieb himself, the bottom of the pocket is found in every case at the deepest point of separation of the united mouth epithelium and enamel epithelium. This means that the pocket is not formed between the cuticula dentis and the deeper layers of the enamel epithelium but between the surface of the mouth epithelium, which now represents a part of the pocket epithelium and the already more or less degenerated enamel epithelium.

These observations approximate those of Weski and Euler, who believe that

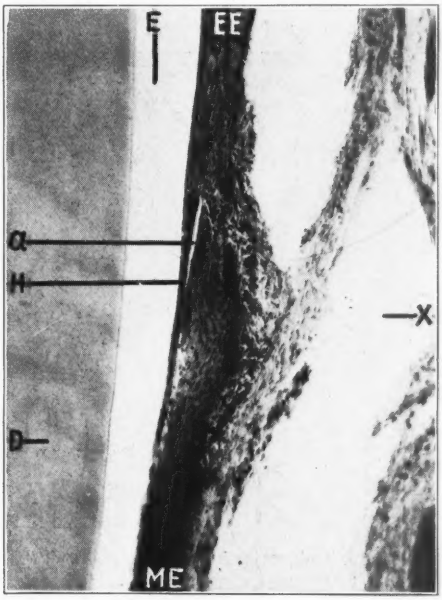


Fig. 7.—Epithelial attachment on the labial side of a rat's incisor. The hornification of the enamel epithelium progresses gradually only where the growing mouth epithelium covers the greatly reduced enamel epithelium; i. e., the mouth epithelium indicates pocket formation. *D,* dentin; *E,* enamel; *EE,* enamel epithelium; *H,* reduced and hornified enamel epithelium (cuticle); *ME,* mouth epithelium; *X,* artefacts. (Leitz: obj. 16; eyep. 8; × 105.)

the pocket is formed by an intra-epithelial splitting. As a matter of fact, it may be observed that the intra-epithelial splitting (Fig. 3) has the appearance of real pocket formation. But, in most of these cases, we find this splitting to be caused by the preparation of the sections. Since, in a great number of cases, the enamel epithelium and the mouth epithelium show a strong tendency to proliferation, it is often not very easy to distinguish between the cells of the mouth epithelium and those of the enamel epithelium (Fig. 8). But a closer examination of the bottom of the pocket gives us the clue in most cases. The pocket formation in those cases also takes place between the mouth epithelium and the enamel epithelium (intra-epithelial splitting). The latter degenerates gradually so that the mouth epithelium lines one side of the pocket by the time the bottom of the pocket has reached the cemento-enamel junction.

Before the epithelium of the mouth atrophies and grows downward along the enamel epithelium, the superficial layer between the enamel epithelium and the surface of the tooth is, in many cases, changed to such an extent that a uniform broad reddish yellow layer, stained by hematoxylin-eosin, appears in the picture. In Figure 9, this layer is plainly seen and covers almost the entire crown. This is the cuticula dentis, which continues down over the cementum (Fig. 10) and so should not be considered as a specific product resulting from a change in the enamel epithelium exclusively, but also from a change in the proliferated enamel epithelium along the cementum.

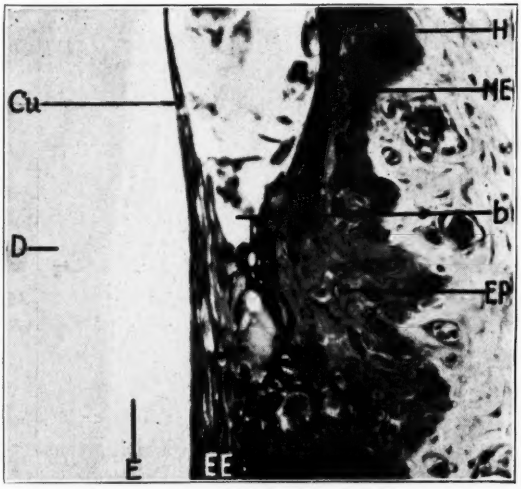


Fig. 8.—Pocket formation at *b* by degeneration of the enamel epithelium, in a pig; proliferation of basal cells of mouth epithelium (*EP*) along the enamel epithelium. *Cu*, cuticle with flattened cells of the enamel epithelium (*EE*); *D*, dentin; *E*, enamel. (Leitz: obj. 16; eyep. 8; × 110.)

Lund[7] has discovered that the iron reaction on this cuticle, which originates in the enamel epithelium, is Berlin blue. In other words, this cuticle *in vivo* is able to absorb ferric salts. Weski, as well as Meyer[8] and Lund, is not able to secure the colors characteristic for horn when he stains the cuticula dentis of Gottlieb. This may be caused by a difference in the degree of hornification of this layer.

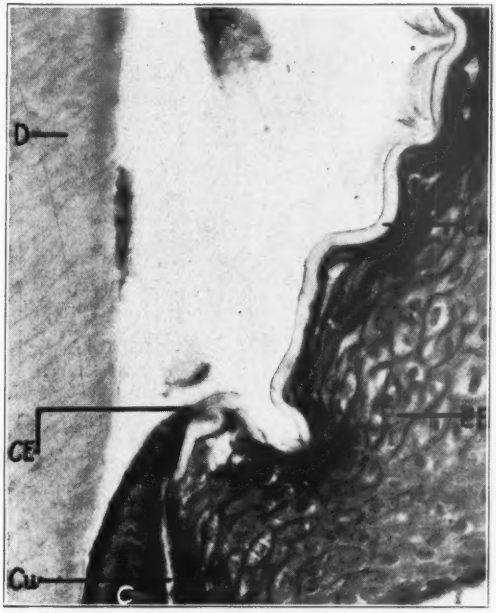


Fig. 9.—Cuticula dentis (*Cu*) between enamel epithelium (*EE*) and enamel (*E*), in a human being. The enamel was lost by decalcification; the epithelium near the cuticula is inflated and shows necrosis in several places. *C*, cementum; *CE*, cemento-enamel junction; *D*, dentin. (Leitz: obj. 4; eyep. 4; × 147.)

Findings such as those shown in Figures 1 and 2 are very difficult to compare with those shown in Figure 6 because in the first pictures we are dealing with dogs and in the second with human material. In none of the specimens of material from dogs could the superficial epithelial layer be demonstrated as it is seen in Figures 6, 9 and 10. Comparative studies have shown that, despite differences in their appearance, these layers are of the same formation.

The degeneration and hornification of the enamel epithelium, which are of importance in the pocket formation, depend upon:

1. The time of the disappearance of the ameloblastic layer. In other words,

7. Lund, O.: Ueber die Epithelcuticula, Vrtljschr. f. Zahnheilk., 40: 1, No. 1, 1924.

8. Meyer, W.: Histologische Untersuchung über Entstehung und Verlauf der sog. Alveolarpyorrhoe beim Hund, Vrtljschr. f. Zahnheilk., 40, No. 2 and 3, 1924.

if the ameloblastic layer disappears a long time before the eruption of the tooth, we may expect an early degeneration and hornification of the enamel epithelium (human). But if this disappearance does not occur until the time of eruption or later, the change in the whole enamel epithelium comes at a noticeably later period (dog and pig).

2. As a consequence of the condition described in the preceding paragraph, the process of eruption itself: i.e., under the influence of this process, changes which prepare the way for the formation of the enamel membrane are taking place in the deeper layer of the enamel epithelium.

Examining the pictures of pocket formation published by the Vienna school, we observe the same facts, namely, that the enamel epithelium is destroyed when it is covered by the epithelium of the mouth and the bottom of the pocket is found at the point of separation of the epithelium of the mouth from the enamel epithelium. These illustrations also confirm the observation that the enamel epithelium has suffered some degree of degeneration where it is covered by the mouth epithelium. Up to the present

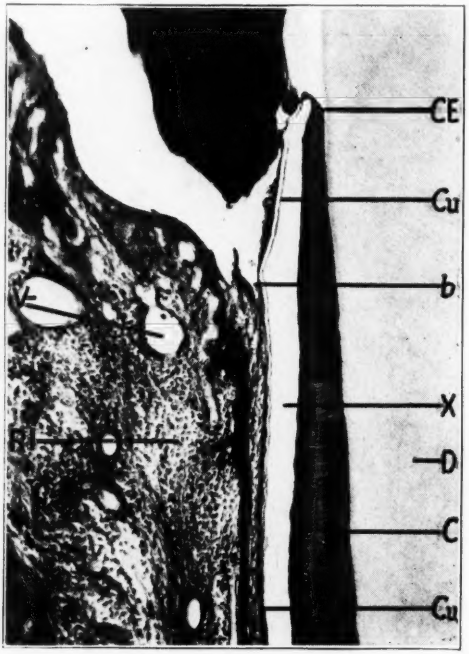


Fig. 10.—Paradentosis in a human being. The surface epithelium has disappeared; the interdental papillae consist of granulation tissue. The cuticula dentis (*Cu*) does not stop at the cemento-enamel junction (*CE*), but the cuticle formation continues along the cementum surface. *b*, bottom of the pocket; *RI*, round cell infiltration; *C*, cementum; *D*, dentin; *V*, vessel; *X*, artefact. (Leitz: obj. 16; eyep. 4; × 42.)

time, we believed that both layers of the epithelium united in such a manner that a separation between the two was no longer possible. As a matter of fact, it seems that the activity of the mouth epithelium in the question of pocket formation is much more important than we used to think. Through these observations, we arrived at a compromise between the conclusions of Gottlieb and Weski on the question of pocket formation.

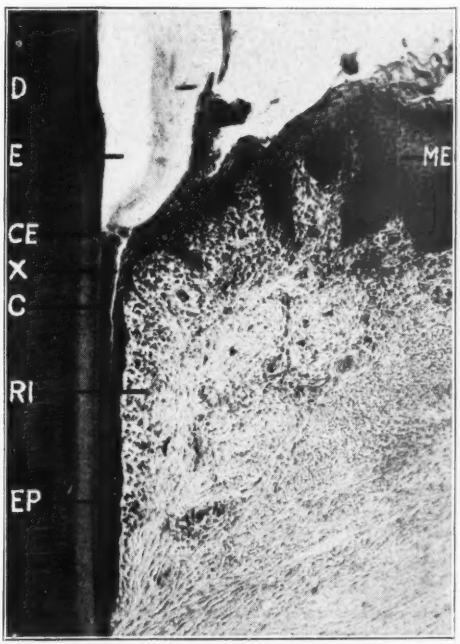


Fig. 11.—Pocket on the cemento-enamel junction (*CE*), in a monkey. The epithelium has grown along the cementum. There is an artefact at *x*. Subepithelial round-cell infiltration (*RI*) does not reach the lowest point of proliferation (*EP*). There is no pocket between the cementum (*C*) and the area of epithelial proliferation. In this case, an inflammation is not the cause of this proliferation. *D*, dentin; *E*, enamel; *ME*, mouth epithelium. (Leitz: obj. 16; eyep. 8; × 15.)

One of the most remarkable conclusions reached by Gottlieb is that, under normal conditions, the bottom of the pocket is approximately located on the cervical third of the anatomic crown when the tooth has reached the line of occlusion. It is slowly displaced apically with increasing age. A growth of epithelium has taken place along the cementum by the time the pocket has reached the cemento-enamel junction. The eruption of the tooth does not stop at the cemento-enamel junction as we once thought, but the epithelium grows further apically, whereby the pocket becomes deeper until finally the epithelium reaches the apical foramen, and the tooth is exfoliated from the socket. Gottlieb describes this proc-

ess as the physiologic eruption of the tooth. This opinion has been attacked from many sides, and for good reasons. One cannot imagine that a structure which has as many physiologic functions as the tooth could die and be eliminated as a foreign body by the growth of epithelium enclosing the root. However, I have found no sections whatever in which the enamel epithelium had not already begun to grow along the cementum at the time when the mouth epithelium had reached a certain distance from the cemento-enamel junction; so that an epithelial sheet always exists. Under all circumstances, I have found that this proliferation is derived from the enamel epithelium and not from the mouth epithelium.

From the interesting and valuable work on the measurements of pockets by Orban and Köhler, it is evident that the normal depth is less than 1 mm. Our clinical and histologic experience shows that we often find such a shallow pocket. In some cases, it is so shallow that it cannot be entered by an instrument. Figures 1 and 2 present a case in which the tooth is just breaking through and no pocket has been formed as yet. This case represents, so to speak, an ideal (Gottlieb). Thus, we see that the deciding

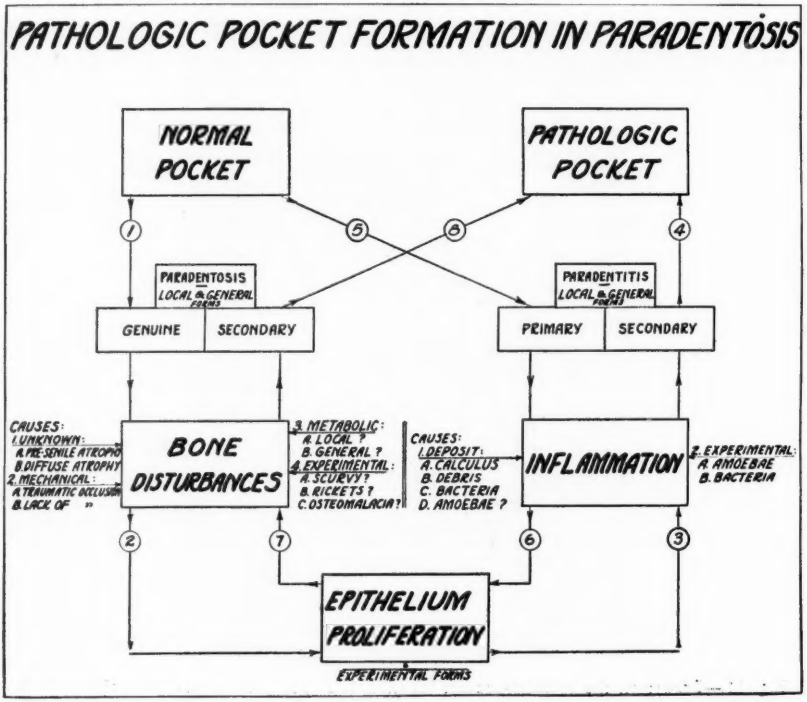


Fig. 12.—Pathologic pocket formation in paradentosis (pyorrhea).

factors in this process are the degenerating enamel epithelium on one side and the downgrowth of the mouth epithelium on the other. If the degeneration of the enamel epithelium takes place rapidly and the mouth epithelium for some reason does not follow to cover the defect, it is possible that a *locus minoris resistentiae* is formed which offers an entrance to infection. We observe that the recession of the free margin of the gum toward the apex parallels that of the bottom of the pocket; that is, in the atrophic process, ratio between the breaking down of the enamel epithelium, simultaneous downgrowth of the mouth epithelium and atrophic activities of the mouth epithelium are constant. As soon as there is a disturbance in this correlation, whether by inflammation or by injury, we have not only a pathologic activity but also, and as a consequence, a pathologic pocket.

PATHOLOGIC POCKET FORMATION

What characterizes the pathologic pocket? We have learned from clinical

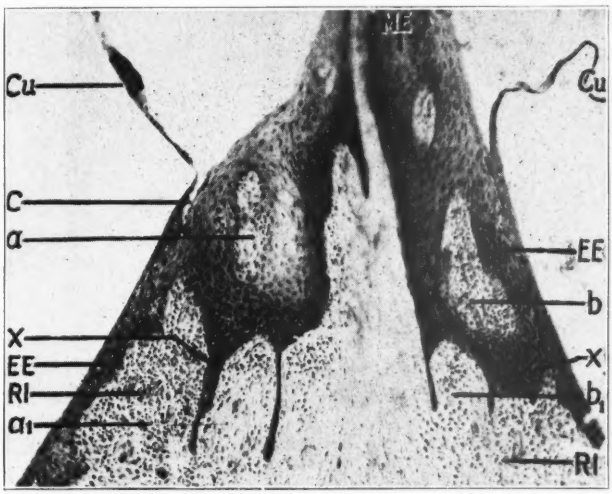


Fig. 13.—Interdental papilla between first and second upper right bicuspid, in a monkey. *a* and *b*, inflammatory area surrounded by epithelium; a_1 and b_1, new area of inflammation; *X*, epithelial shoots; *Cu*, cuticle; *EE*, enamel epithelium; *ME*, mouth epithelium; *RI*, round cell infiltration. (Leitz: obj. 16; eyep. 8; × 50.)

the depth of the pocket is constant under normal conditions. While we find that the enamel epithelium is covered by the mouth epithelium which grows downward in order to cover it when it is degenerating, an atrophy of the whole papilla takes place, corresponding to its height. Therefore, we may, in all cases, speak about a normal pocket in which the and histologic experience that the originally very shallow pocket which is formed by the activity previously mentioned may deepen under certain circumstances. It was natural that, at first, it was thought that an accelerated proliferation of the epithelium took place which, in the majority of cases, was observed together with the inflammation.

We know furthermore that when an inflammatory process exists in the gum, an atrophy, which we deem necessary in order to maintain the pocket, cannot take place. The mouth epithelium is forced to grow downward in order to cover the degenerating enamel epithelium, and thus the deepening of the pocket takes place. In the last year an effort has been made to determine whether there is a certain ratio of dependence between the deepened pocket which is the downgrowth of the epithelium and the immediate environment. Most authors believe inflammation is the most important factor, but the Vienna school is of the opinion that neither the degree of separation of the epithelium from the surface of the tooth nor the position of the gingiva can be responsible for the proliferation of the epithelium. From their observations of the proliferation of the epithelium, they suppose that a reduced vitality of the cementum induces the epithelium to grow downward. This hypothesis appears to me to be very difficult to prove in practice, but I shall emphasize in this connection that I have

Fig. 14.—Split between mouth and enamel epithelium by lack of fusion, in a dog. *a*, round-cell infiltration; *b*, a long epithelial shoot; *c*, necrotic cell masses, which indicate that we are not dealing with an artefact at *c*; *Cu*, cuticle. (Leitz: obj. 16; eyep. 4; × 60.)

seen several cases in which inflammation does not come into question as a cause of this extreme proliferation of epithelium along the cementum. Whether or not this condition has any connection with our study of diet will be mentioned elsewhere. Figure 11 shows such a case.

After observation of a great deal of material, the impression is that inflammation is a great factor in the downgrowth but that the "pathologic pocket" depends on all the surroundings so that it is frequently necessary to seek for a correlation with the whole organism. Thus, we get into the field of paradentosis, in which we find a deepened pocket in the majority of cases. We will consider the chart in Figure 12, in which we can see more easily the conditions in paradentosis as well as in paradentitis. In this chart, we have both the pathologic pictures: paradentosis (genuine and secondary) and primary and secondary paradentitis. If we follow the path which is made by a genuine paradentosis, started in a normal pocket (stage 1), we see that it is not accompanied by any inflammation, proliferation of the epithelium or bone disturbance. We also can diagnose it clearly in stage 2, on account of the clinically absent inflammation, the normal pocket and bone disturbance. This observation is identical with those of Hopewell-Smith,[9] Fleischman[10] and Gottlieb: namely, that we find primary bone disturbance without inflammation in the early stages of paradentosis. In stage 3, we may, under certain conditions, clinically have a normal pocket, since the proliferation of the epithelium is not demonstrable, either clinically or by the roentgen rays. Here, a pocket can be observed which has been slightly deepened, that is, it is more than 1 mm. deep, without showing any signs of inflammation. Perhaps this deepening of the pocket may be due to any of the agents which in Figure 2 have caused bone disturbance as well as an accelerated degeneration of the enamel epithelium so that the mouth epithelium grew downward to cover the defect but does not keep pace with its atrophic activity. But I wish to emphasize that we do not always find an equally degenerated enamel epithelium.

The beginning of the degeneration of the enamel epithelium and the downgrowth of the mouth epithelium is accompanied, in the majority of the cases, by a proliferation of the basal cells of the enamel epithelium, especially at the junction of the mouth and the enamel epithelium, so that apparently there is a fusing of both epithelial layers.

With the accelerated degeneration of the enamel epithelium, micro-organisms find a suitable medium for growth in the tissue where resistance has been lowered. This results in a proliferation of the basal cells of the enamel epithelium as well as the mouth epithelium, which is a protective measure for the subepithelial tissue.

In Figure 13, it is evident that the mouth epithelium and the enamel epithelium are proliferating in an attempt to surround the area of round-cell infiltration, and are thereby lessening the danger, at least temporarily.

At *a* and *b*, this attempt has been successful, while at *x*, new shoots have appeared as a result of further inflammation at a_1 and b_1, the purpose of which is to encapsulate this inflammatory area.

9. Hopewell-Smith, Arthur: Pyorrhea Alveolaris. Its Patho-Histology, Dental Cosmos, 53: 397 (April) 1911; Pyorrhea Alveolaris. Its Interpretation, ibid., 53: 981 (Sept.) 1911.

10. Fleischman, Leo, and Gottlieb, Bernhard: Histologie und Pathogenese der Alveolarpyorrhoe, Ztschr. f. Stomatol., 18, No. 2, 1920.

The bottom of the pocket on the left side is at *c*, and the direction of further pocket formation is indicated by degenerated enamel epithelium, loosened by preparation. Any other manner of formation of a pocket is practically inconceivable. No cuticula dentis as illustrated in the preceding pictures is visible.

With the accelerated degeneration of the enamel epithelium, proliferation of the mouth epithelium and the enamel epithelium increases, and in the majority of cases, is accompanied by inflammation. But there are cases, as I have stated, in which the enamel epithelium proliferates downward without inflammation (Fig. 11). The purpose of this proliferation is unknown, but it is not, as in other cases, to surround the inflammatory area. Such cases are very rare and may be caused by endogenous factors (vitamin deficiency?).

If we now follow stage 3, we soon find that an inflammation, observable clinically, has begun. This, on the one hand, is a consequence of a more or less marked loosening of the teeth, started by the primary bone disturbance, and deepening of the pocket (epithelium proliferation) as a result of degeneration of the enamel epithelium. On the other hand, we know that the presence of each pocket means retention of food remnants and bacteria, which consequently leads to an inflammation. Thus, we have the picture of a paradentitis which, in this case, is superimposed on the genuine paradentosis and, therefore, must be considered as secondary. The final stage (4) shows a pathologic pocket, the result of the inflammation, epithelium proliferation and bone disturbances.

Clinically, we cannot distinguish between this final stage of the genuine paradentosis and the primary paradentitis, which is better designated as the final stage of the secondary paradentosis, "filth pyorrhea" *(Schmutzpyorrhoe,* Gottlieb[11]).

We now follow a second path leading to the same picture. Beginning at the normal pocket (stage 5), we do not find bone disappearance first, but rather an inflammation due to calculus, unhygienic conditions or injurious agents. This primary paradentitis (stage 6) is clinically easily recognizable and shows no bone disturbance in the roentgenogram. We observe in the histologic picture the epithelium proliferation and bone resorption caused by inflammation. The pocket is deepened and, in the final stage, we have all the symptoms of a paradentosis which we may designate as a secondary paradentosis, or filth pyorrhea, since it started from a "primary paradentitis." As the final stages, 4 and 8, are absolutely alike, a differential diagnosis is impossible in most cases. Perhaps some day biochemistry will solve the question.

The etiology of the paradentitis, or the secondary paradentosis, is no longer unfamiliar to us; but it is different from the genuine paradentosis. In order to gain more knowledge of the etiology of the genuine paradentosis, the first step in research would be to analyze the cases in which primary bone disturbance or epithelium proliferation with deepening of the pocket is found.

In experiments, we must begin with the production of both of these changes. We may start at stage 1 and produce a primary bone disturbance. At the same time, considering the entire organism, and especially the surrounding tissue of the alveolar process (epithelium, peridental membrane and cementum), we may produce epithelium proliferation experimentally. Up to this point, we deal

11. Gottlieb, Bernhard: Schmutzpyorrhoe, Paradentalpyorrhoe und Alveolaratrophie, Vienna: Urban und Schwarzenberg, 1925.

only with the "noninflammatory" form of paradentosis, which afterwards is superimposed by a secondary paradentitis.

If we, on the contrary, start with a production of a primary inflammation (primary paradentitis), we can obtain only a secondary paradentosis. Consequently, I cannot agree with the ameba theory nor with an attempt to produce an experimental paradentosis by amebae, because, by infection of the pocket with amebae, primary inflammation and epithelium proliferation is produced, with the final stage of a "filth pyorrhea," or secondary paradentosis, and this has nothing to do with the genuine paradentosis. The same holds true for the toxic substance lately found by Beckwith and Williams[12] in necks of teeth in pyorrhea cases. Since this poison was obtained in stage 4 as well as stage 8, perhaps only in stage 8, which is filth pyorrhea, Beckwith and Williams should furnish the proof of the direct influence of this toxic substance on the alveolar bone and epithelium.

In cases in which we are dealing with genuine paradentosis, it is necessary, as far as therapeutics is concerned, to try to stop any of these changes in the paradentium.

If we, for instance, in stage 3, attempt only a "reattachment" and ignore the bone disturbance, we cannot stop the process, since the condition which has brought about these changes is not known. Therefore, it is evident that we must produce a healing of the mucous membrane when it is inflamed whether this inflammation is primary or secondary, in order to strengthen the tissue and create a higher resistance.

Since we, in most cases, deal with both stages 4 and 8, not knowing to which group of cases they belong, it is necessary first to clear up the inflammation through extensive cleaning of the pathologic pocket. Since we know little about the causes of the bone changes and what practical or therapeutic measures will bring about regeneration, there is nothing to do but to reproduce the former anatomic conditions. The disease may be treated with one of the conservative or one of the surgical measures with which we are familiar, the method of treatment depending on the stage of the disease.

In conclusion, we may say that, in general, the depth of the pathologic pocket in paradentosis has nothing to do with the diagnosis, which depends entirely on the condition of the tissue. From a therapeutic standpoint, on the other hand, we must first seek to eliminate the pocket even if it is 2, 3, or 5 mm. deep, since a pocket always means accumulation of food débris and bacteria, and the pathologic picture always shows inflammation. Therefore, whether or not the pocket is inflamed or discharges pus is not important. The therapeutic measures should consist of eliminating the pathologic pocket by normal surgical procedure and eventually in removing the pathologic part of the bone.

Up to the present time, it has not been possible in any case known to me to obtain reattachment by means of instrumental treatment. Gottlieb,[13] in his last publication, has discussed the relation between "peridental curettement and reattachment," according to Box. I shall not venture into this field of the discussion at the present time. Scientific proof must be demanded from those authors who claim the possibility of reattachment.

12. Beckwith, T. D.; Williams, A.; Rose, E. J.: Rôle of Bacteria in Pyorrhea, M. J. & Rec., 129:333-336 (March 20); 376 (April 3) 1929.

13. Gottlieb, Bernhard: Paradentalpyorrhoe und Alveolaratrophie, Fortschr. d. Zahnheilk., 5: 357-358, 1929.

In summarizing, it must be stated that a pocket can be considered pathologic only when the normal depth of approximately 1 mm. has been exceeded and this has been accompanied clinically by bone disturbances and inflammation. These three are the determining factors in a pathologic pocket. Because of our histologic knowledge, we can say that epithelium proliferation has already taken place even though this condition is not recognizable clinically. In this connection, whether the epithelium is still attached to the cervical third of the crown or to the surface of the root is immaterial.

Under normal conditions, the destruction of the enamel epithelium takes place slowly and the process is completed between the twentieth and thirtieth year. In other words, the anatomic crown has broken through entirely and the bottom of the pocket is situated at the cemento-enamel junction. If this destruction occurs earlier, it is the result, in every case under my observation, of a pathologic process. In every case in which the bottom of the pocket has reached the cemento-enamel junction, the epithelium proliferation along the cementum has taken place. These observations, made on a great quantity of material, corroborate Gottlieb's statements. Because this newly formed epithelium which originates from the enamel epithelium is of greater vitality and resistance than the old enamel epithelium, degeneration of this proliferated epithelium does not proceed so rapidly, and, therefore, the mouth epithelium has less opportunity to grow downward. In other words, if the degeneration of the enamel epithelium is normal, we find, between the twentieth and thirtieth year, that, in the condition which should be described as normal, there is a shallow pocket at the cemento-enamel junction without any bone disturbance or inflammation.

This picture will not change unless affected by injurious influences. As soon as we find a pocket more than 1 mm. in depth below the cemento-enamel junction, we are dealing with a pathologic process, the appearance of which has been described. If the individual is full grown and the whole endocrine system is functioning fully in every respect, single disturbances may occur which lead to a weakening of the paradentium, causing a loosening of the teeth. This may be caused by bone disturbances or by epithelial proliferation, when the tooth and the bone become separated, or by inflammation. If such disturbances occur before the bottom of the pocket has reached the cemento-enamel junction, we are dealing with a pathologic process in youth which may lead later to a paradentosis. It is regrettable that this is true in the majority of cases at the present time.

This pathologic process may begin during the eruption of the tooth in the form of a high degree of inflammation which causes a noticeable damage to the soft tissue surrounding the crown of the tooth. Damage may be done so early that a fusion of the two epithelial layers is prevented.

Such a condition is shown in Figure 14. We are dealing in this case with a dog which showed extensive inflammation on the buccal side of the front teeth, with bleeding during their eruption. In the histologic picture, we find a split between the mouth epithelium and the enamel epithelium, which is similar to the intra-epithelial split, according to Weski and Euler. Because of the inflammation (remnants at *a*), a fusion of the two epithelial layers has not occurred. At *b*, a long epithelial shoot is visible which shows a tendency to rapid proliferation

in the direction of the enamel epithelium. Between the ameloblastic layer (which can be followed into the cuticle even after eruption of the tooth has taken place) and the free margin of the gum, we find necrotic cell masses. These indicate that we are not dealing with an artefact in this case. The epithelial shoot is the result of the inflammation, indicating an attempt of the mouth epithelium to cover the defect caused by lack of fusion. This shoot will cut off the nutrition from the enamel epithelium and increase the speed of its degeneration and the pocket formation. Furthermore, this specimen shows distinctly that the pocket formation occurs between the mouth epithelium and the enamel epithelium. In other pictures, it can be seen distinctly that, immediately after the fusion of the epithelial layers, a destruction of the interdental papilla by inflammation occurs. The whole epithelial tissue is damaged by this process, increased destruction of enamel epithelium, lack of protection against the oral cavity, decrease of power of resistance and disturbances of bone, peridental membrane and perhaps of the cementum as well, resulting. Therefore, we must come to the conclusion that, during eruption, the strictest attention must be paid to the soft tissue. In cases of beginning inflammation, everything must be done to relieve this process as soon as possible so that serious injuries to the subepithelial tissue shall not result. If inflammatory conditions are allowed to remain, a chronic state of inflammation may develop, and even though the greatest care is taken, the foundation for a paradentosis is laid which constitutes the predisposing factor in this disease.

SUMMARY

1. In order to arrive at a satisfactory understanding of the formation of a pathologic pocket, we must know what constitutes "normal" conditions in the paradentium.

2. The term "normal pocket" refers to the gingival sulcus (crevice) or physiologic pocket.

3. From the study of a large amount of material, it has been demonstrated that, without exception, when the epithelium of the mouth becomes fused with the enamel epithelium and the removal of necrotic cell remnants follows, the degeneration of the enamel epithelium progresses apically and the mouth epithelium proliferates downward to cover the defect in the surface. Concurrently, the cuticula dentis is left intact on the surface of the teeth. This means that the normal pocket is not formed between the cuticula dentis and the deeper layer of the enamel epithelium (Gottlieb) or by an intra-epithelial split (Weski), but between the surface of the mouth epithelium, which now represents a part of the pocket epithelium and the enamel epithelium, which is more or less degenerated. The bottom of the pocket proceeds apically by this progressive degeneration of the enamel epithelium.

4. As long as the ratio between the atrophy of the free margin and the progressive degeneration of the enamel epithelium is constant, we may consider that the pocket is still normal.

5. As soon as this correlation is disturbed, whether by inflammation or injury, we have not only a pathologic activity but also, and as a consequence, a deepened (pathologic) pocket.

6. As a result of our investigation, we are unable to agree with the opinion of the Vienna school that the bottom of the pocket does not stay at the cementoenamel junction any longer than at any other point on the surface of the tooth. But we have confirmed Gottlieb's statement that as soon as the bottom of the

pocket has reached the cemento-enamel junction, the enamel epithelium has already started to proliferate apically. We have found this to be true in every case under our observation. In other words, when the original enamel epithelium has entirely disappeared, the bottom of the pocket, together with the mouth epithelium, is at the cemento-enamel junction (from 20 to 30 years of age), and we find a layer of new epithelium along the cementum. At this stage, the picture is similar to that which we find when the tooth has just reached the line of occlusion, with the difference that the bottom of the pocket is not on the cervical third of the anatomic crown but at the cemento-enamel junction.

7. Under normal conditions, because this newly formed epithelium seems to be more resistant to degeneration than the old embryonal enamel epithelium, the mouth epithelium has no incentive to grow further apically. This explains the conditions that we find clinically in old persons who still have shallow pockets at the cemento-enamel junction. If the tissues are injured or become inflamed at this stage, the bottom of the pocket may move apically again, but this time the process would be pathologic.

8. A classification of all cases of so-called pyorrhea (paradentosis and paradentitis) showing their etiologic relationship is as follows: We must distinguish two fundamental forms of the so-called pyorrhea: genuine paradentosis, on which later may be superimposed a secondary paradentitis and primary paradentitis, which may lead to a secondary paradentosis. The genuine paradentosis starts with bone disturbance or epithelium proliferation; the causes are not definitely known in every case. The primary paradentitis starts with an inflammation due to deposit (calculus, débris or bacteria). As both types lead to a pathologic pocket formation, it is impossible, at the end, to determine whether the initial stage was paradentosis or paradentitis.

9. In the treatment of the pathologic pocket, we must eliminate: (1) the factors which cause bone disturbance, epithelium proliferation and inflammation, and (2) the deepened pocket, by one or another of the successful methods known at the present time.

OSTEOMYELITIS OF THE JAWS*

By JOSEPH E. SCHAEFER, M.D., D.D.S, B.S., LL.B., Chicago, Ill.

IN order to understand osteomyelitis, one must know the nature of normal bone and its reparative possibilities, and, secondly, must appreciate the reaction of bone to infection. Bone is a calcified connective tissue, protective and supportive in function, to which the musculature is attached. It is of a hard and unyielding nature because of its mineral content, but is nevertheless responsive to the functional demands of stress and strain. Vernon David, in a study of fractures of long bones in children at the Cook County Hospital, demonstrated that, in

*Read before the Illinois State Dental Society, Springfield, Ill., May 15, 1929.

the face of angulation and overlapping after repair, these bones assumed their normal length and contour. After a period of time, neither by mensuration nor roentgen-ray examination was there evidence, in many of these cases, of a previous fracture. He concluded that the shortening was compensated for by a stimulated growth at the epiphyseal line.

In the repair of a fracture in a long bone, there are three calluses laid down: an external callus between periosteum and bone; an intermediate callus between the fragments, and an internal callus in the medullary canal. Only the intermediate callus remains, the other two being absorbed by rarefying osteitis. The intermediate callus finally condenses by a sclerosing osteitis, so that the internal and external architecture of the bone is restored. Wolff called attention to the principle that the contour and density of a bone is the result of the stresses and strains applied to it functionally. Vernon David's observations on fractures illustrate the working of this principle.

I laid down the premise in my opening statement that in order to understand the pathologic processes in bone, one ought to have a clear conception of the normal ones; for which reason I am going to review normal bone briefly.

Bailey states that, grossly, bone is of two types, spongy, or cancellous, and dense, or compact. They do not present two distinct types of osseous tissue, differing only in degree of porosity. In spongy bone, the spaces are larger and the bony matter is reduced to slender spiculae and bars. Compact bone is likewise porous, but the channels are narrow and the bony tissue is abundant and more densely packed. Each bone, except at its articular end, is surrounded by a vascular fibroelastic coat, the periosteum. Bones, as regards their method of development, are of two types and are known as cartilage or substitution bones and membrane bones. The difference in the two methods of ossification lies in the fact that the membrane bones have no cartilaginous stage and are formed directly from the embryonal connective tissue. The two modes of ossification apply only to the development of the bone as an organ, the histogenesis of bone tissue being the same in both types and always implying a transformation of embryonal connective tissue into bone by specially modified connective tissue cells, the osteoblasts, or bone forming cells.

INTRAMEMBRANOUS OSSIFICATION

When studying the cranial bones, one observes early that the embryonal connective tissue becomes richly vascularized and active proliferation of cells takes place. Some of these undergo structural changes and become osteoblasts. These form a hyaline ground substance, and if fibers are present in the embryonal tissue, they become embedded and masked by the ground substance. But when fibers are not present, the homogenous matrix formed by the osteoblasts soon shows the presence of collagenous fibers. As the process advances, some of the osteoblasts are completely surrounded and become bone cells. Such young bone or osteoid tissue is, at first, soft, but soon the deposition of lime salts takes place. The calcium particles appear in the matrix, become more and more numerous and form a continuous vitreous mass around the bone cells.

Bone formation involves two temporally distinct processes, osteoid formation and calcification. The first is entirely due to the activity of the osteoblasts. The second is probably independent of the cells, the matrix extracting and precipitating lime salts from the tissue fluids. The bone spiculae increase in number and

size by the activity of the osteoblasts. The osteoblasts arrange themselves in single file, forming an epithelioid layer along the margin of the already formed bone. They continue to form new osteoid layers, which subsequently become calcified. In this manner, irregular anastomosing bone trabeculae are formed, enclosing the larger primary marrow space containing the embryonal marrow (osteogenic tissue), consisting of a young richly vascularized connective tissue in which osteoblasts and primitive marrow cells are constantly differentiating as growth proceeds. The continued deposition of bone leads to a gradual reduction of the size of marrow cavities and ultimately forms compact bone. The growing bone becomes surrounded by a fibrous membrane, the periosteum, the inner layer of which is made up of osteogenetic tissue. This subperiosteal tissue, which is merely the outer layer of the primary bone-forming bed, is rich in multipotent connective tissue capable of differentiating into bone, on the one hand, and into fibrous connec-

Fig. 1.—Eight-day forceps extraction (longitudinal buccolingual section of the socket).

tive tissue of the periosteum, on the other hand.

Bone formation and bone resorption occur simultaneously and continue as parallel processes until bone growth ceases. Osteoblasts from the osteogenetic layer of the periosteum arrange themselves in rows along the peripheral margins of the bone trabeculae and constantly form new layers of spongy bone. Simultaneously with subperiosteal bone formation, resorption of earlier formed, more deeply lying bone spiculae takes place. This is at least partly accomplished by large multinucleated cells, the osteoclasts, which appear closely applied to the inner surface of the trabeculae, often lying in little depressions which they have hollowed out in the bone. The removal of the calcium salts is probably determined by the acidity (carbonic acid) of the blood and tissue fluids, the osteoclasts effecting the destruction of the osseous matrix (osteoid) by phagocytosis.

Fig. 2.—Fourteen-day forceps extraction (longitudinal buccolingual section of the socket).

Bone marrow is a soft tissue which occupies the medullary cavity of long bones, the larger haversian canals and all spaces between the trabeculae of spongy bone. Two varieties of marrow are recognized, red and yellow. Red marrow is found in fetal and young bone; but, in the adult, it is restricted to the vertebrae, sternum, ribs, cranial bones and epiphysis of the long bones. It is the chief blood-forming organ of the adult being, the source of the red blood cells and the granular leukocytes. Marrow is made of a delicate reticular connective tissue in the meshes of which lie various kinds of cells. During the fetal and the growth period, it forms part of the osteogenetic tissues which furnish the osteoblasts for bone development.

Fig. 3.—Twenty-one-day forceps extraction (longitudinal buccolingual section of the socket).

Yellow marrow consists, in the main, of fat cells which have gradually replaced other marrow elements. With an adequate stimulus, such as a fracture, yellow marrow may reassume the character

of red marrow and play an active part in the process of bone repair.

I have purposely quoted at length from Bailey in order to freshen your minds on normal bone growth and to bring up the rather interesting clinical phase of the blood calcium-phosphorus relationship to normal calcification. The study of bone processes depends largely on the examination of specimens microscopically. These are naturally dead sections in which normal structures are studied, from which the functions of certain elements are interpreted. For example, when certain large multinuclear cells are seen in lacunae on a spicula of bone, the conclusion is reached that they are bone destroyers.

We are limited in the study of bone by the fact that it cannot be observed as a living tissue. Even if it were physically possible to do this, we should still be confronted with the chemical phase of the problem, for we have no way of knowing what chemical changes are taking place in the living tissues. Bailey suggests that probably the removal of calcium in bone destruction is determined by the acidity (carbonic acid) of

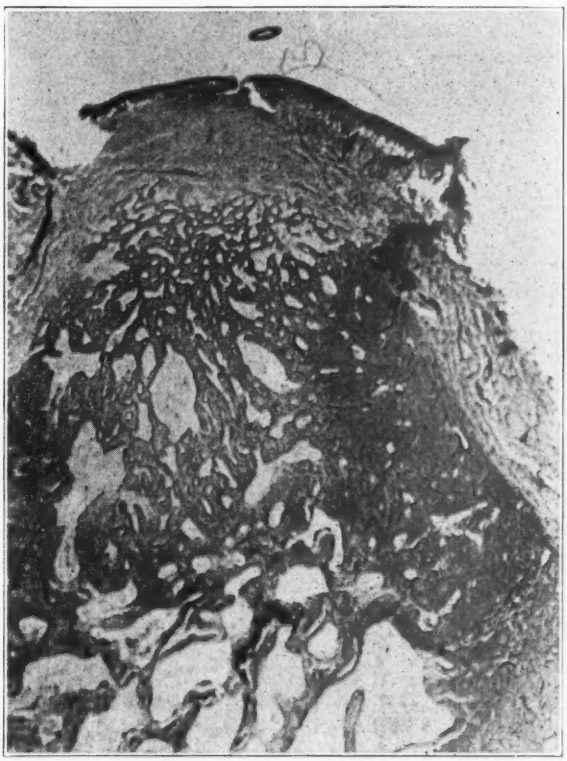


Fig. 4.—Forty-nine-day forceps extraction (longitudinal buccolingual section of the socket).

the blood and tissues fluids, and that the transformation of the osteoid structure into a calcified one is brought about by the matrix extracting and precipitating lime salts from the tissue fluids.

In the light of this explanation, it is interesting to review McCallum's work on rickets in which the blood shows a reduction in the calcium and phosphorus relationship. This is determined by the amount of calcium in milligrams per hundred centimeters of serum times the phosphorus in milligrams per hundred centimeters of serum. No healing takes place in rickets if the product of these two factors is less than 30. Little healing follows unless the product is from 35 to 40. Peterson, on the basis of this information, studied seventeen cases of fractures, eleven of which showed a deficiency of calcium and phosphorus. In this study, he cites a case of fracture of the ulna and radius which failed to unite after three open operations until the calcium-

Fig. 5.—Forty-two-day wound associated with loss of the buccal cortical plate (buccolingual longitudinal section).

phosphorus relationship had been brought to the point where the product of these factors were 41.6. He came to the conclusion that healing of fractures did not take place when the inorganic constituents, calcium and phosphorus, are so reduced that the product of these elements is less than thirty. Little healing takes place between 30 and 35, while active healing results with a product between 35 and 40. When one studies the histologic nature of bone and the mechanism by which calcification takes place, it is not a reasonable explanation that normal bone cannot be laid down if the calcium and phosphorus are not brought to it in sufficient concentration by the blood and tissue fluids?

Warren Schram, at Northwestern University, under the direction of E. H. Hatton, has been studying the healing process of the alveolar bone following simple extractions, as compared with the so-called surgical removal. I have included in this discussion some of his sections, as they illustrate the process of bone repair as well as the time interval that nature requires to accomplish this task. Two of the slides are of exceptional interest, one in which the normal healing

Fig. 6.—Forty-nine-day wound, associated with destruction of the buccal plate.

process was apparently interfered with and the other a demonstration of the principle laid down by Wolff that bone deposition is called forth to meet the functional stresses and strains applied to it. (Figs. 1-2.)

Figure 1 shows an eight-day forceps extraction (longitudinal, buccolingual section of the socket). The socket is filled with an organizing blood clot the surface of which is completely covered with epithelium. The organization of the clot has advanced more rapidly near the crest of the alveolar process and at the bottom of the socket. Numerous newly formed blood vessels project into the clot from the bony walls of the socket and between them are columns of connective tissue that stain deeply with eosin and fuchsin. There is a hint that calcification of these connective tissue columns is already under way.

Figure 2 shows a fourteen-day forceps extraction (longitudinal, buccolingual section of the socket). The changes already noted in the eight-day socket as characteristic are equally apparent in this section. Organization of the clot is slowest in the middle of the socket. The columns of connective tissue projected from the bone of the socket are distinctly calci-

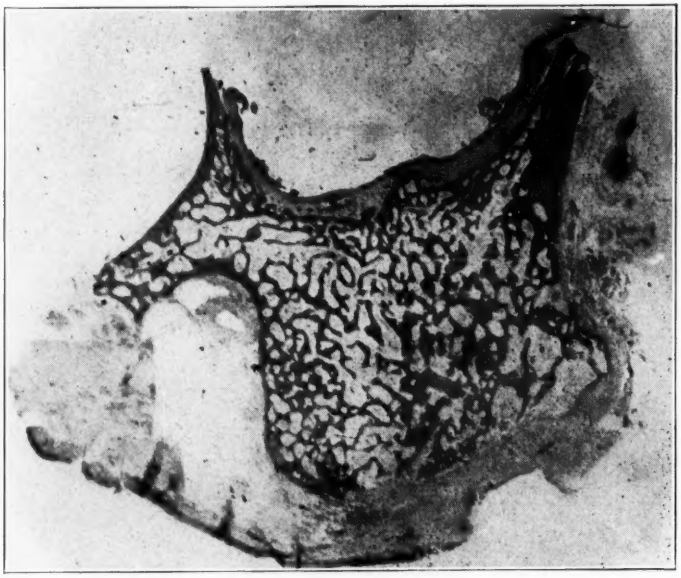


Fig. 7.—Section of human maxilla, showing presence of cancellous bone containing bone marrow.

fied; that is converted into new, spongy bone (cancellous bone). At the crest of the alveolar process are some regions of resorption. Resorption seems to be controlled in a way by the necessity of reconstructing the crest to meet a new situation.

Figure 3 shows a twenty-one day forceps extraction (longitudinal, buccolin-

gual section of the socket). The columns of newly formed cancellous bone now stretch entirely across the socket, at about the level of the top of the alveolus, and this also is true of the region at the bottom. The center of the socket still contains a small partly organized portion of the original blood clot.

above the level of the old bone. Whether this is higher or lower than the old crest is uncertain. There is no definite cortical plate over the top of the socket, although in older human specimens such a definite cortical plate is nearly always present.

Figure 5 shows a forty-two day wound associated with loss of the buccal, cortical

Fig. 8.—Section of human mandible, showing presence of cancellous bone and marrow spaces.

Figure 4 shows a forty-nine day forceps extraction (longitudinal, buccolingual section of the socket). The whole socket has been filled with cancellous bone, and at the site of the level of the former alveolar crest, new bone is heaped up slightly

plate (buccolingual, longitudinal section). In this extraction, as the result of a series of happenings, a buccal mucoperiosteal flap sagged away from the socket. A clot did not form and the epithelium, instead of growing across the socket,

grew down over the lining of the flap and down the walls of the socket. There is necrosis and sequestrum formation of the bone uncovered by these accidents. The influence of the irritation of the bone and pericemental membrane is seen in the resorption of the cementum and dentin of the adjacent root of the deeply embedded curved cuspid tooth.

Figure 6 shows a forty-nine day wound, associated with destruction of the buccal plate. The bone in this mandible is very light, and the shell of cortical bone, thin. The space around the mandibular canal is greatly exaggerated on this account. The loss of the buccal plate has been compensated by two layers of subperiosteal bone on both the buccal and the lingual sides. This is obviously accounted for by the realinement of strains put on this section of the mandible by the loss of the buccal plate.

There has crept into our dental teaching the notion that one could not have an osteomyelitis of the maxilla and mandible because a medullary cavity does not exist in these bones. Osteomyelitis, as the term signifies, is inflammation of the bone and marrow. The term is applicable to an inflammatory process of the jaws if one demonstrates the presence of bone marrow in the maxilla and the mandible. Bone marrow is not only found in the medullary canal of long bone, but in the spaces of spongy bone. The following sections demonstrate the presence of cancellous bone in both jaws, so that an inflammatory process involving all of these bony elements can well be called an osteomyelitis. (Figs. 7-8.)

The essential thing to remember in acute osteomyelitis is that an inflammation of bone differs in no way essentially from that of any other vascular tissue. The effects of inflammation in bone are modified by the resisting character of the osseous structure. In an acute inflammation, we have a rapid engorgement of the blood vessels and an inflammatory exudate, with emigration of leukocytes. Soft structures readily expand to accommodate these processes, but, in bone, because of its unyielding nature, necrosis results. Rose and Carless suggest that the death

Fig. 9.—Diffuse osteomyelitis of the mandible involving the lower first permanent molar.

Fig. 10.—Case shown in Figure 9. New bone formation, with molar going on to complete development.

of bone is due to thrombosis. They further state that if the process is subacute, so that the tissue-liquefying properties of the exudate and the tissue-absorbing activity of the leukocytes can come into play, osteoporosis, or rarefaction of the bone, follows; a condition sometimes termed caries. On the other hand, if the inflammation is chronic and due to causes other than tuberculosis or the pressure of tumors, new formation occurs and osteosclerosis or condensation is most likely to result. Necrosis, caries and sclerosis are results of inflammation and must neither be confounded with the pathologic proc-

Fig. 11.—Case shown in Figures 9-10. The molar shows complete development in spite of the severe bone infection, which has cleared up.

esses leading to them nor described as distinct diseases. Phemister gives us a more detailed picture of the whole process. He states that there are three sources of bone infection: from the blood stream, by direct extension from soft parts and from open wounds of the bones such as occur in fractures. General lowered resistance of the body frequently precedes the infection. An acute inflammation of the upper respiratory tract is occasionally a precursor of osteomyelitis.

PATHOLOGY

Pyogenic infection in bone produces the same type of reaction as pyogenic infection in other tissues, but the results are different, owing to the presence of inorganic lime salts, which limit the spread of the infection and which persist in the field after the acute inflammatory reaction has subsided. Organic ele-

Fig. 12.—Scar at site of bone curettement, one year after the bone infection had occurred.

ments are rapidly broken down by proteolytic enzymes liberated by the infiltrating leukocytes. The lime salts are unaffected by the enzymes and are slowly renewed by the direct action of the granulation tissue, which comes in intimate contact with them. The method of breaking down the lime salts is not

known. It is believed that an acid field is present along the junction where calcium-phosphate and calcium-carbonate are split. Another difference is that partial defects from loss of bone are not filled out rapidly as in the case of infection of soft parts. This is because of the sclerosis and rigidity of the infected bony walls and their inability to collapse. For these reasons, destructive bony processes are of longer duration. As to the extent of pathologic change, osteomyelitis is classified as localized and diffuse types, which may be either acute or chronic.

Fig. 13.—Case shown in Figure 12. The occlusion is normal.

An acute diffuse osteomyelitis begins in cancellous tissue usually followed by vascular engorgement, edema and leukocytic infiltration with necrosis of both cancellous bone and bone marrow. It may extend through the cortex and periosteum, or it may strip up the periosteum and destroy cortical bone. Early incision may prevent either the extension of the pus into the soft parts or extensive necrosis of the periosteum.

Changes in the subacute stage after the disease has ceased to spread in the bone are of a reparative nature. These begin earliest and occur most rapidly if adequate drainage has been established. The disease process may become localized in ten days or two weeks, but, in extensive cases, may require a longer time. The reparative changes which become very active with the subsidence of the acute infection are accomplished by the activity of the osteoblasts, osteoclasts and pyogenic granulation tissue and may be considered under three heads: 1. Changes in the necrotic bone. 2. Formation of new bone. 3. Changes in the old living bone.

1. Dead bone is absorbed by the action of granulation tissues which spring about its margins, removing both dead and living bone along their line of junction. Granulation tissues absorb all of the dead bone present in small amounts, leaving a cavity behind. These tissues detach the dead from the living bone as a sequestrum when it is present in large amounts. Organic elements in dead bone are broken down by proteolytic ferments of the exudate. Dead bone is attacked by granulation tissue soon after the onset of an infection, and gross evidence of absorption usually becomes manifest in from seven to fourteen days. The zone of demarcation between living and dead bone is jagged and irregular in outline. Grooves are formed along the periosteal and endosteal surfaces at the limits of the dead bone and are gradually deepened until separation is complete. The time required for sequestration is variable according to the density of the bone involved. Spongy bone may be sequestrated in from two to three weeks; cortical bone, in from two weeks to three months. The rate of absorption of dead bone depends on its contact with granulation areas of the living bone. When it is not

in contact with living bone, the rate of absorption is retarded. The density of dead bone remains unchanged. It is avascular and does not lose the lime salts. It is greater than new bone, which is spongy in structure, and that of older living bone, which undergoes atrophy from disuse.

2. New bone forms from the periosteum in the region of the infection. It may be laid down both in periosteal and in endosteal surfaces. Surviving periosteum about the dead bone forms a layer of new bone, or involucrum, which gradually increases in density and thickness and forms part of a new shaft. If the periosteum is killed, the involucrum is absent. Periosteal new bone is usually deposited along the cortex for some distance beyond the limits of the dead bone. New bone increases in amount for weeks or months. It gradually increases in density and certain portions may take on a cortical arrangement.

3. Surviving bone which is continuous with the necrotic bone is rapidly absorbed by granulation tissue in the process of sequestration. Adjacent portions may show irregular areas of absorption. This is known as rarefying osteitis. The old bone in the region undergoes marked atrophy of disuse. As healing takes place, there is a transformation in the old bone beyond the limits of the portions lost by the infection, which brings about the alinement of the remaining shaft with the involucrum. Complete healing may occur within a few months when an operation is properly performed, but usually the disease passes into the chronic stage. This may be due to infection in sclerosed bone, or to the presence of cavities the walls of which are sclerosed, or to sequestrums.

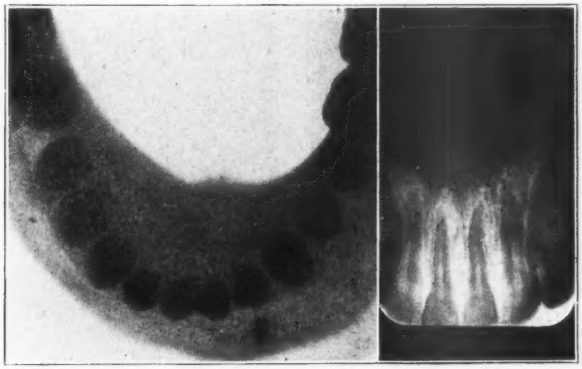


Fig. 14.—Case shown in Figures 11-12. New bone formation is shown about the previously loosened teeth.

Discharging sinuses which persist, with recurring attacks of a mild nature, are not uncommon.

DIFFUSE SCLEROSING OSTEOMYELITIS

The infection in diffuse sclerosing osteomyelitis is of a low grade and may involve a large area. The exudate is small in amount and may be serous or mucous instead of purulent. There is little bone killed and the exudate usually disappears without drainage. Extensive bone formation along both periosteal and

endosteal surfaces may take place. In a long bone, a dense spindle shaped swelling, which remains the seat of a low-grade infection for years unless treated, is usually formed.

ACUTE LOCALIZED OSTEOMYELITIS

The changes in acute localized osteomyelitis are the same as in a diffuse osteomyelitis, but remain localized. Pus and granulation tissue form and the necrotic bone is rapidly absorbed, leaving an abscess. The inflammatory reaction extends to the surrounding cancellous bone and periosteum, resulting in a variable amount of both periosteal and endosteal bone formation. The acute reaction subsides, but the cavity persists. It usually becomes lined by granulation or fibrous tissue. Pus may remain for indefinite periods, or it may be replaced by a serous exudate in which the gross lesion at operation may be very similar to that of a bone cyst. The wall usually becomes moderately sclerotic. When a localized osteomyelitis begins subperiosteally or endosteally along the course of the shaft, destruction of a small area of the cortex takes place by rapid absorption.

Fig. 15.—Mandible twelve days after the extraction of the right second and third molars.

DESTRUCTION AND RECONSTRUCTION OF ALVEOLAR BONE

A phase of bone destruction about the jaws which is of particular dental interest is that of the alveolar bone supporting the teeth. Blair, in a paper on simple osteomyelitis of the jaws published in 1926, credits Virgil Loeb with calling his attention to the retention of the teeth and tooth buds in a necrosed area. Blair states that it was his practice to remove these on the theory that they must be dead and could only act as harbingers of infection. Loeb demonstrated by a series of roentgenograms certain partially developed though slightly deformed teeth definitely surrounded by dead bone which later had become fixed in the newly developed jaw bone. In this case, Dr. Loeb

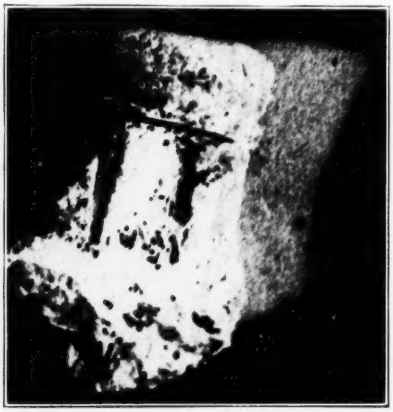


Fig. 16.—Large granuloma attached to right lower first molar, probably the seat of a latent infection which became acute as a result of the trauma caused by the extraction of the second and third molars.

had not performed a radical operation, but had waited for the dead fragments to be thrown off spontaneously, with the result that the tooth buds had continued to develop and became fixed. I have a series of films given me by Dr. Loeb which demonstrate the destruction and reconstruction of alveolar bone about a first molar tooth. (Figs. 9-11.)

At the time, I called Dr. Blair's attention to an article by Cryer, who quoted

Fig. 17.—Extensive bone destruction as seen four weeks after the onset of the bone infection (right side).

Percy of Paris, in 1791, as having observed that loosened teeth in the necrosed area recovered their original solidity. Dr. Percy describes a case in which the patient lost all of the center of the jaw, leaving only the rami, to one of which was attached a section of alveolar bone. He states that the teeth which had not come away with the diseased bone floated about without support except by the gums. It was astonishing that most of the teeth which remained after the removal of the pieces of bone had recovered their original stability although deprived of alveoli and vessels. The left first bicuspid, two incisors and the right last molar at length became firmly implanted in the thickened gums in the middle of the bony paste, which finally took its place in such a way that, without receiving nourishment or possessing life, these teeth rendered the same service that they rendered before.

REPORT OF CASES

Shortly after I returned from a year's serv-

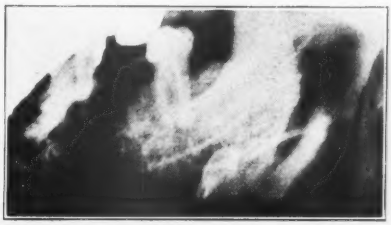


Fig. 18.—Case shown in Figure 17; left side. The infection has advanced to the molar region.

ice with Dr. Blair and while I was resident physician in oral surgery at the Cook County Hospital, a boy, aged 14 years, came to the hospital with the history of having had a pimple on his chin which had become infected. The infection invaded the soft structures and penetrated the mandible. At the time I saw him, he had an osteomyelitis involving the mandible from the right to the left second bicuspid. All of these teeth were loosened by the process. The attending surgeon wanted to extract some of them. Having in mind the foregoing facts, I persuaded him to leave the teeth. An incision was made in the labial and buccal sulcus, the necrotic bone was removed and the unhealthy granulation tissue curetted away. At the conclusion of this procedure, these teeth were

attached only by the supporting gum tissue and were tipped back on the tongue. They were drawn back to their normal position by an alinement wire and held until new bone was laid down. Figures 12-14 show that there is good occlusion, and recent roentgenograms reveal new alveolar bone about their apical ends. Recently, we tested these teeth for vitality and they all responded.

This case illustrates the importance of maintaining teeth, at least in a young person, in spite of a bone infection, provided they are not foci of infection themselves.

Following is the history of a case of acute diffuse osteomyelitis of the mandible.

A street car conductor, aged 38, had two lower right molars extracted one week prior to his admission to the hospital. The teeth were badly decayed but not abscessed. (The latter statement was made by the dentist). Forty-eight hours after the extraction, the right side of the face became badly swollen and the patient was confined to his bed, having a high temperature and rapid pulse, which had continued. On admission, the temperature was 101 F., and a brawny induration involved the whole right side of the face, extending into the neck. The mouth could be opened only with difficulty. A drainage incision was present in the region of the lower cuspid, which exuded a thin grayish yellow fluid. This, when cultured, showed pneumococci and streptococci. The direct smear showed pneumococci and the spirochetes of Vincent. The blood count was 13,000, and the blood Wassermann reaction was negative, as were also blood cultures the third day after admission. On the fifth day, the temperature rose to 105 F., and as localization had taken place in the neck, incision and drainage were instituted. The hemostat was found to pass along what felt like denuded bone to the inner side of the ramus and as far forward as the cuspid. Dakin drainage

Fig. 19.—Case shown in Figures 17-12, about two years later.

Fig. 20.—Full mouth roentgenogram, taken about one month before an acute osteomyelitis of the mandible developed.

tubes were inserted and flooded daily with 3 c.c. of surgical solution of chlorinated soda for a period of eleven days. Roentgenograms taken four days after admission, or eleven days after tooth extraction, revealed a large area of rarefaction about the apex of the distal root of a crowned lower first molar which had been filled for fourteen years. The sockets of the second and third molars were negative according to the roentgenograms. (Fig. 15.) (The roentgenograms were taken the day before incision and drainage were instituted, when the bone was felt to be denuded. Probably, the bone was necrotic at that time, but the roentgen-ray evidence was negative. Dead bone, as pointed out by Phemister, casts a dense shadow, and the

Fig. 21. — Diffuse osteomyelitis of the mandible.

changes which are apparent later are due to the action of living tissues in their attempt to break down the mineral content of the bone; thus, in early necrosis, roentgen-ray evidence is of little value.)

The infective process had extended to the bicuspid teeth on the left side of the mandible and loosened all of the teeth up to this point. The loose teeth were extracted four weeks after the original infection. They all came away clean except the lower right first crowned molar, which had a large granuloma attached to it. (Fig. 16.)

The appearance of the bone at this time is due, as Phemister has pointed out, to uneven erosion of the dead bone by the action of granulation tissues, which reduce its density. (Figs. 17-18.)

The patient was dismissed with the drainage wounds discharging freely and was instructed to return in three months for sequestrectomy. Two large sequestrums were removed, one by the surgeon attending him, and one after the patient's return to the hospital three months later. I recently corresponded with the patient and was able to have a roentgenogram taken. The patient states that he has fully recovered and a recent roentgenogram, although not satisfactory in all respects, reveals a serviceable restoration of the mandible on the side which was so extensively involved. (Fig. 19.)

The next case is interesting as the story of the progress of a bone infection is told by a series of roentgenograms. As

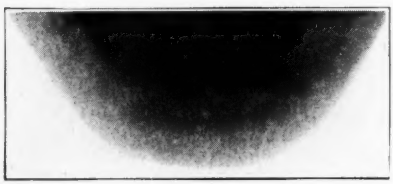


Fig. 22.—Case shown in Figure 21 (vertical exposure through the anterior part of the mandible).

I was unable to get a written record of the case, the history had to be reconstructed from what I was able to gather from the patient and the dentist, using the dates of the roentgenograms as the guiding posts in the progress of the disease.

The first is a full mouth film, dated Oct. 8, 1927. At this time, the patient had a severe Vincent's infection. You will note that there is a rarefied area about a pulpless lower left second bicuspid. (Fig. 20.) The patient's story was that in the interval between the date given and that of the next roentgenogram, which is dated Nov. 10, 1927, about one month later, the following happened: A swelling developed in the left submaxillary

region, which continued for a period of six days, when hot applications were applied. Two days later, an abscess was opened, and according to the patient's statement, about a cup of pus was obtained. Three days later, six lower anterior teeth were removed because they had become badly loosened. Two days later, another abscess was opened, on the opposite side of the jaw. Roentgenograms dated Nov. 10, 1927, reveal a well advanced case of osteomyelitis of the anterior portion of the mandible, with the lower anterior teeth missing. (Figs. 21-22.) The next films are dated Dec. 14, 1927. By this time, the disease had apparently run its course. New cortical bone had replaced the "worm eaten" anterior part of the mandible as evidenced by the film dated November 10. This is best seen in the

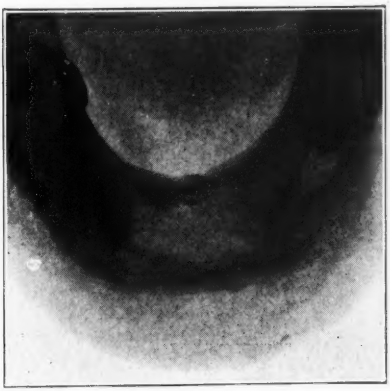


Fig. 23.—Vertical exposure through the anterior part of the mandible, showing two large areas of bone destruction.

films taken vertically through the mandible. The one dated December 14 reveals two rather large cavities in the cancellous bone, where reconstruction has not gone on to completion at this time. (Fig. 23.) The final roentgenograms, taken one year after the onset, reveal good restitution of the diseased area. The vertical exposure through the anterior portion of the mandible shows the bone cavities in the cancellous bone well restored to the appearance of normal spongy bone. (Fig. 24.)

The treatment in the case was conservative, with drainage and irrigation followed by the removal of sequestrums as they developed. The patient stated that, in this interval, when the infection was at its height, he was severely ill and was of a saffron color, his face being badly swollen, with pus draining freely into the mouth and from the drainage wounds.

It is the typical story of a bone infection, and one speculates on the possible relationship between the severe Vincent's infection, the pulpless lower left bicuspid and the subsequent osteomyelitis. Phemister states that in an osteomyelitis, the causative organism is generally the staphylococcus and that bone infection is often preceded by lowering of the resistance. He cites a case of an osteomyelitis following a severe respiratory infection.

LOCALIZED OSTEOMYELITIS

It is more difficult to draw the line in the mandible between diffuse or local osteomyelitis. The difference is based on the extent of the process and is a relative term.

The next two cases reveal a bone involvement which is more limited in extent than the two cases just reviewed.

A colored patient gave the history of having a lower right second molar extracted, swelling developing on the second day, with external incision and drainage on the fifth day. When he entered the hospital four months later, the swelling was still present, with a sinus discharging into the mouth from which pus drained freely. (Fig. 25.) The roentgenogram revealed an area of bone destruction extending from the site of the extracted tooth down to and including the lower border of the mandible. (Fig. 26.) The vertical exposure gave very valuable information as it revealed the position of the sequestrum and the presence of a good strong lingual plate of bone. (Fig. 27.) An incision was made in the buccal sulcus, the eroded sequestrum lifted out and the cavity carefully cleaned. Through and through drainage was established by excising the necrotic skin area below the level of the bicuspids. The incision in the mouth was T-shaped, which gave good exposure of the bony cavity and permitted

the mucoperiosteal flaps to fall in, aiding in filling the bony defect. Within two weeks, the soft parts were nicely healed and there was no evidence of previous infection.

One has no hesitation in calling the second case a definite localized osteomyelitis.

The patient, aged 13 years, came in Dec. 30, 1927, with a swelling at the right side of the mandible extending from the median line to the second bicuspid area, which fluctuated on palpation. External drainage was instituted and a foul greenish yellow discharge escaped. The history given by the patient was that two weeks previously a deciduous tooth was extracted, and one week later swelling developed. This persisted up to her entry into the hospital. A roentgenogram dated Jan. 12, 1927, revealed an incompletely developed cuspid with a portion of the crown missing and a well defined area of rarefaction surrounding an area of dense bone, which was interpreted to be a sequestrum. (Fig. 28.) Because of the incomplete development of the apical end, the cuspid was removed, as was the sequestrum also. The cuspid was found to have what appeared to be a toothpick projecting through the incompletely developed apical end. (Fig. 29.)

One rather suspects that in the extraction of the deciduous tooth, the permanent tooth was injured and the wooden peg had been driven through the pulp chamber and root canal—an old method of devitalizing the pulp. The final roentgenogram, taken ten months later, revealed complete regeneration of bone in the cuspid region. (Fig. 30.) There is another interesting point in this film, the evidence of a sclerosing osteomyelitis about the lower first molar. The picture suggests dead pulp in that tooth with an area of apical rarefaction surrounded by sclerosing cancellous bone; a reaction which follows a low-grade infective process.

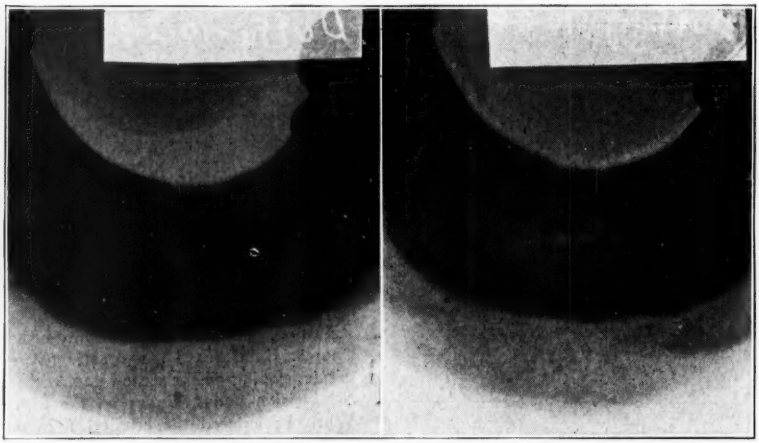


Fig. 24.—Case shown in Figure 23, one year later. The bone is well healed.

The following illustrations (Figs. 31-34) demonstrate nicely the time which it takes to sequestrate a mass of necrotic bone. The patient had a large squamous cell carcinoma with no palpable glands in the submental or submaxillary regions. The entire tumor mass was removed with a diathermy point, the operator cutting

well beyond the indurated border of the growth. As the tumor had involved the bone in the region of the incisor teeth, the entire involved area was coagulated with the diathermy current. It took just thirty-five days for nature to separate this large sequestrum, which was lifted out from a bed of granulation tissue. Repeated biopsies of the adjacent tissue revealed no carcinomatous cells.

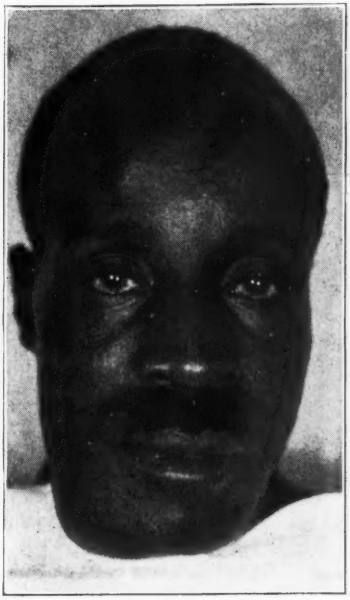


Fig. 25.—Hard bonelike swelling of the mandible.

TREATMENT

Blair, in a paper on simple osteomyelitis of the jaws published in 1926, lays down the following principles:

First, the early establishment of drainage of the focus with the least possible operative trauma; second, waiting until the virulence of the infection has subsided, the dead bone has spontaneously separated and sufficient new bone has been formed to maintain continuity before attempting any radical operation; third, at the proper time to remove all fragments of dead bone with limited damage to granulations lining their beds, and where practicable to remove all edges of live bone that overhang so that soft tissue can drop into and fill these defects. When the above program is faithfully and intelligently carried out, the disease will seldom prove fatal or progressive and successful—sequestrectomy followed by permanent healing will usually be accomplished by one operation.

A case in which there was a failure of regeneration of the mandible is shown in Figures 35-37. The patient came to my attention about six years ago, and because of the ghastly end result, I

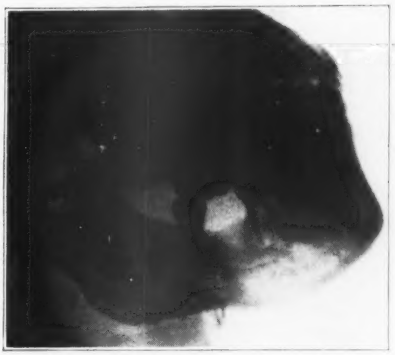


Fig. 26.—Chronic localized osteomyelitis of the mandible.

searched carefully through the records of two hospitals to get the story:

A boy, aged 6 years, admitted to the hospital March 28, 1919, showed swelling and tenderness about the right side of the mandible, with several small sinuses discharging a thin pus, these communicating with the bone. There was swelling and fluctuation over the lower one-third of the left femur, but no limitation of motion of the knee and no apparent joint involvement.

Operations: April 2, the femur was curetted and packed with iodoform gauze, with a rubber drain through both incisions (incision through the sinuses in the jaw). Removal of

the sequestrum and curettement of the cavity were carried out, and iodoform gauze and a drain were inserted.

May 21, the former cavity in the jaw contained a little necrotic bone and a large amount of granulation tissue. The incision was enlarged at both ends, the bone cavity curetted and one tooth removed.

May 14, the existing sinuses in the jaw were enlarged and all granulation tissue and necrotic bone were curetted out with a spoon curet.

June 25, an incision was made backward along the ramus of the jaw from the right side. The periosteum was elevated and necrotic bone and granulation tissue were removed. One molar tooth was removed with the granulation tissue. The area of the jaw was scraped clean.

Fig. 27.—Vertical view through the mandible, showing the position of the sequestrum. (Case shown in Figure 26.)

An incision was made forward over the angle of the mandible, disclosing an overgrowth of cancellous bone. Necrotic bone was removed and the angle of the bone scraped clean.

An incision was made backward from the left sinus about 1 inch along the ramus of the jaw. The bone was scraped and granulation tissue and necrotic bone were removed. Accompanying illustrations show the end result.

In commenting on similar cases, Blair makes this statement:

Much more disastrous than the removal of tooth buds is the complete lack of regeneration that may follow the too early removal of the dead bone on the attempt to control infection by resecting the original live bone. There never has come under our notice a single instance of failure of regeneration of the mandible following a simple osteomyelitis that had not been subjected to early energetic bone surgery.

Let us contrast the treatment of this case with one reported by M. H. Cryer.[1]

A boy, aged 9 years, came in with a badly swollen face, with pus discharging into the mouth and through sinuses in the neck.

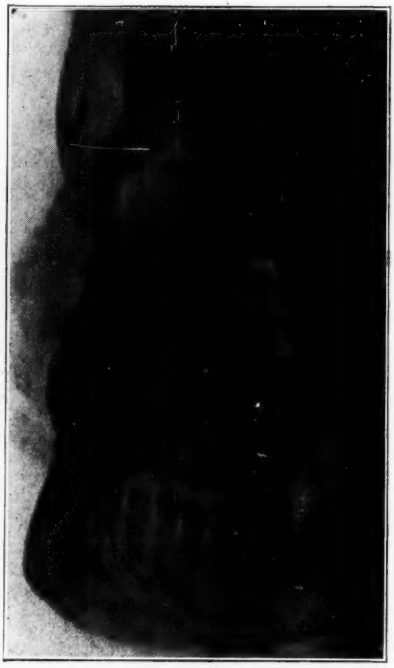


Fig. 28.—Chronic localized osteomyelitis of the mandible, with sequestrum in the cuspid region.

In October, 1912, a roentgenogram revealed a necrotic condition of the mandible, with new bone formation.

1. Cryer, M. H.: Dent. Cosmos, 58:861 (Aug.) 1916.

November 29, the roentgenograms still revealed the presence of the dead bone, but with still further deposition of new bone.

June 6, the films revealed a further increase in the size of new bone.

May 18, the old necrosed jaw was removed, two years and seven months after the onset of the process. (Fig. 38.) A photograph of the sequestrum displays the entire ramus of a mandible up to the sigmoid notch with coronoid and condyloid process missing, including the lower portion of the body of the mandible up to and beyond the region of the cuspid tooth. The author makes this comment, "Had this dead bone been removed as soon as it was diagnosed, the anterior portion of the mandible would have moved backward and to the side, but by keeping the old bone in place so that it might act in the nature of a splint, time was afforded for a new half mandible to be reformed."

Fig. 29.—Case shown in Figure 28. Extracted cuspid and sequestrum.

When one compares results between the account of this case and the preceding one, no comment is necessary on the choice between active surgical interference and conservative handling of a case with due consideration for nature's reparative process, which immediately comes into play with the quiescence of the active infection.

PREOPERATIVE AND POSTOPERATIVE CONDITIONS LEADING TO OSTEOMYELITIS OF THE JAWS

As dentists, we are more concerned with those cases in which the place of entry of infection is through some lesions about the mouth. Osteomyelitis of the jaws may follow scarlet fever, measles and smallpox, or it may be of hematogenous origin, but these are not the cases seen in ordinary dental practice. Blair, in an analysis of thirty-nine cases in his practice, reports thirty-three of these as being apparently associated with periodontal infections, and of this number thirty-one were associated with extraction during the acute state of the infections. Here, then, we have the most frequent source of bone infection about the jaws, and the one in which we are most vitally concerned. This brings up immediately the problem as to when we

Fig. 30.—Case shown in Figure 29. The bone is healed in the cuspid region and there is sclerosing cancellous bone about the lower first molar.

should, and when we should not, extract an acutely infected tooth. Having seen in the course of one year about sixty-five cases of severe infections around the jaws, the majority of which followed the extraction of teeth in the process of an acute infection, I am inclined to be extremely conservative in this matter. I believe that Blair's argument on this problem is absolutely sound. He presents it in a paper under the title "The Ulcerated Tooth":

The above term commonly designates an acute exacerbation of a previously quiescent periapical infection. This naturally and by common consent will call for the ministration of the dental surgeon. The attack may terminate or be terminated in one of several ways. After two days of suffering, an abscess may perforate the bone, causing the typical "gum boil," or less commonly it may burrow out alongside of the root of the tooth. The dentist may get drainage through a root canal, or an attempt may be made to abort the process by extracting the tooth. The latter treatment has the virtue of precluding future attacks and may be followed by quick recovery or by a more or less protracted stormy convalescence, or occasionally by death from general sepsis.

It was an old teaching in dentistry that these teeth should not be pulled during the period of acute swelling and there is usually sound clinical observation back of these older teachings. With more modern and antiseptic technic, the general trend is to substitute active intervention for cultured conservatism, and above all with the advent of the "exodontic" specialist, this older teaching lost precedence. The attempt to establish free drainage and at the same time remove the supposed focus is apt to appeal more strongly to the new dentist. This procedure has been compared to the removal of an acutely diseased appendix, but the simile is inapt because the appendix is the focus of the infection, while the tooth is at this time but an inert plug. In their results the two procedures do not parallel, and the observer standing in the side line who takes occasion to sort over the wreckage is apt to conclude that the average results do not justify the extra risk inherent in early extraction. In a certain small per-

Fig. 31.—Large epithelioma of the lower lip with bone extension.

Fig. 32.—Appearance of patient shown in Figure 31, after complete removal of neoplasm with surgical diathermy.

centage of cases, the reaction is accompanied by an increase of symptoms, or is followed by abscess formation, or extensive bone necrosis. In addition to this, some young or apparently robust people will die from general sepsis following extraction of an "ulcerated tooth" in the acute stage. On the other hand, death following the conservative plan is extremely rare, and except among young children, cervical abscess or extensive bone

Fig. 33.—Sequestrum removed thirty-five days after bone destruction by diathermy.

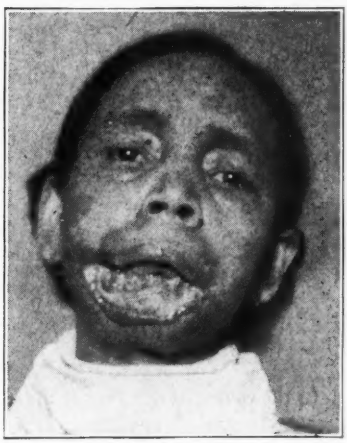


Fig. 34.—Granulation bed from which sequestrum was removed in case shown in Figures 31-33. Repeated biopsy revealed no evidence of the original epithelioma.

necrosis is uncommon, where the tooth and the bone are spared the trauma of instrumentation in the acute stage of the infection.

This may seem difficult to explain, but a study of the history of a typical case will at least furnish food for thought.

The "ulcerated tooth" is a culmination of an infection that has been present for an indefinite time, possibly years, without giving more than mild or unidentified symptoms. Often the root canals of the damaged tooth had long ago been sealed by the dentist, and it is usually difficult to assign any logical cause for the explosion. About the simplest explanation is the assumption that a disturbance of the balance between virulence and resistance has occurred which permits the hitherto imprisoned bacteria to overcome successfully the confining barriers. Such a period of low resistance may be the reason why the trauma of an extraction may not be well tolerated at this particular time. This type

Fig. 35.—Failure of development of mandible after repeated curettement.

of acute osteomyelitis should hold more than an academic interest for both the physician and the surgeon, either of whom must occasionally help a patient choose between the man who offers immediate and permanent relief from a jumping toothache by a painless extraction under gas, and the old-fashioned dentist who prescribes quinine, phenacetin, the mustard foot both, the fig poultice, and who may attempt to establish drainage by the somewhat painful process of opening a root canal. The former may be the more brilliant procedure, but we can still give the conservative man our moral support, with the assurance that this plan is the safer. Besides,

the physician can always add sufficient morphine at least to ease the time of travail and possibly he may shorten it by an incision and a stripping up of the periosteum at the likely site of perforation.

At a later period when the balance between virulence and resistance has been re-established in the patient's favor, extraction of the tooth is not only safe, but is better surgery than the most effective dental restoration.

This taboo against immediate extraction applies only to the period of acute local symptoms evidenced chiefly by swelling of the neighboring soft tissues, and by the pain

Fig. 36.—Appearance of patient in case shown in Figure 35.

and tenderness that are characteristic of early osteomyelitis, not the subacute stage in which discomfort, low fever, adenitis, malaise, rheumatism or joint infections, etc., may evidence chronic infection. If, however, an extraction under these latter conditions is followed by a severe local flare-up, then there may be good reason to go slow on repeating the insult.

Having disposed of the question of acutely infected teeth, the author tells the major portion of the story of osteomyelitis of the jaws. Phemister laid down three possible sources of bone infections: by hematogenous invasion where the atrium is probably through some skin lesion; by direct extension into bone of an infection adjacent to it, and by exposure of bone through a break in the continuity of the soft parts.

With the first, we are not vitally concerned, as they are not the types of cases often seen by the dentist. The possibility of the second route is of more interest to

Fig. 37.—Another view of patient shown in Figure 36.

us. In the course of one year at the Cook County Hospital, I saw three severe infections following mandibular block. All of these cases developed peritonsillar abscess and secondary neck abscesses which had to be drained internally as well as externally. It does not take a great deal of imagination to see how any one of these infections might have invaded the bone. Certainly if an infected pimple on the chin could by direct extension

through the soft tissues invade the mandible, an infection following an injection about the mandibular foramen might do likewise. I have often wondered why so many of the neck abscesses associated with acute infections quickly penetrate the soft tissues and localize there instead of traveling through the cancellous bone. The explanation is probably an anatomic one. Recently, I took care of a case of a severe cellulitis of the neck following an attempted extraction of a lower third molar. The tooth was not fractured, and to look at it, one could not tell that it ever had been disturbed, and yet the patient developed an abscess in the neck which required through and through drainage before the infective process was halted.

A case of osteomyelitis which Dr. Logan had under treatment traveled all the way around the mandible, starting two weeks after the removal of a submerged third molar. The patient was a student at Yale, and the tooth had apparently caused him no trouble until its removal. I saw the young man for Dr. Logan while he was out of the city. At that time, the patient had already been incapacitated for several months and was under the constant care of a trained nurse. He was unable to open his mouth more than one-half inch. He had received alcoholic injections of the mandibular nerve because of the intense pain, and the outlook for immediate recovery was not very hopeful. The history suggests a late infection of a healing surgical wound following the removal of a third molar.

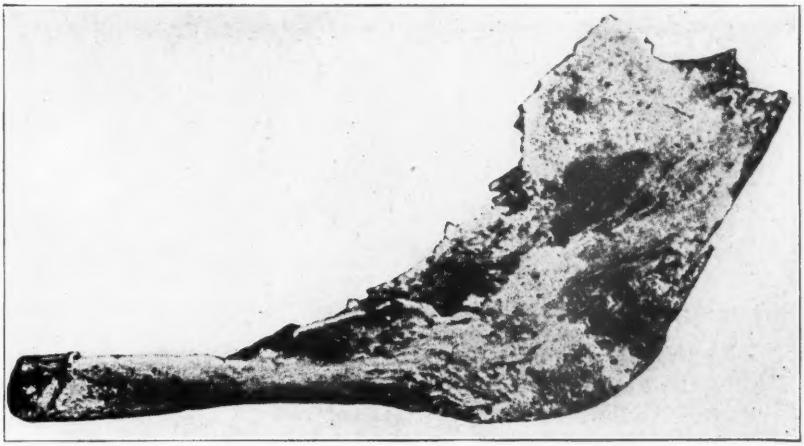


Fig. 38.—Sequestrum removed from diseased mandible. (From the Dental Cosmos.)

The third source of invasion of the mandible by infection is through an open wound in cases of compound fractures. Speed says that infection does not stop bone repair, and cites cases of union of the mandible in which he did direct wiring and where the ends of the wires

served as drains. Our experience has been that bone infection in cases of fractures delays the healing process, but repair ultimately takes place. I have attempted to tell the story of bone. Obviously, such a story cannot be an original one. At best, I have hoped to call your attention to the principles underlying the destruction and reconstruction of a most interesting connective tissue.

Fig. 39.—Appearance of patient before and after cartilage implant. There was no external scar from the operation.

PLASTIC REGISTRATION OF MANDIBULAR RELATION*

By JOHN H. HOSPERS, D.D.S., Chicago, Ill.

IN his recent trip to Chicago, Dr. Gysi said:

The best application of engineering principles to the requirements of individual patients necessitates a single and reliable method of ascertaining and reproducing the fundamental mandibular movements.

For custom-made dentures, it is necessary to learn for each patient the sagittal inclination of the condyle paths and the character of the lateral movements of the incisor point. These should then be reproduced or closely approximated in an articulator. The lateral inclination of the incisor path may be set at the discretion of the operator, without taking measurements or records, to suit the characteristics of the case. . . . It is very important that the positions of the masticating surfaces of the teeth be set in harmony with the masticating forces which act upon them, and that the inclinations of the facets be harmonized with the inclinations of the mandibular movements.

It is my privilege to bring to your attention an instrument that will do these things with the least possible effort on the part of the operator. That instrument is called "the relator." It was invented by Joseph Homer of New York City and is the only truly adjustable instrument in existence today. (Fig. 1.)

The principle involved in the relator is the registration of the condyle paths in a plastic material that solidifies on becoming cold, i. e., modeling compound. The guiding principle in developing these registrations is an occluded set of teeth, or teeth set up on "trubase" plates and true wax rims, tried in the mouth for esthetics and correct central relation, and checkbites from these trials.

Before we go into a discussion of the relator, it will be necessary to determine a satisfactory method of obtaining central occlusion.

Modeling compound impressions are taken of both the upper and lower jaws and removed from the impression trays. Key grooves are cut in the outside of the impressions over the ridges, to act as aids in properly reseating the wax bite, to be taken later. A scribing instrument (Figs. 2-4) is used to mark the depth of the impression on the labial sides of the compound, and then mark the median line on each impression. Next, bite wax is molded over a piece of aluminum (Fig. 5) bent into a horseshoe form, or a Homer bite tray, and, with this as a tray, an impression is taken of the lower ridge. A pyramid of soft bite wax is added at the median line and the patient is instructed to close slowly until told to stop. The impression is cooled and checked for correct facial length and outline and, if too high, the upper part of the wax pyramid is softened or pooled and the operation is repeated. The caliper method is used (base of nose, to eyebrow and nose to chin). Distances should be equal.

If closed too far for symmetry, wax is added to the upper part of the wax

*Read before the Illinois State Dental Society, Springfield, Ill., May 15, 1929.

pyramid. When the operator is satisfied as to face form and contour, wax is added on each side of the central portion to make a complete wax bite.

The median, rest and high lip line of the upper lip and the low lip line of the lower lip and angles are marked. (Fig. 6.) Next, a triangular piece is cut from the labial plate of the wax at the median line, both upper and lower, the apex of the triangle to be at the crest of each ridge impression.

The distance between the two cuts or ridge crests is measured with a set of calipers. This is called the intermaxillary bite.

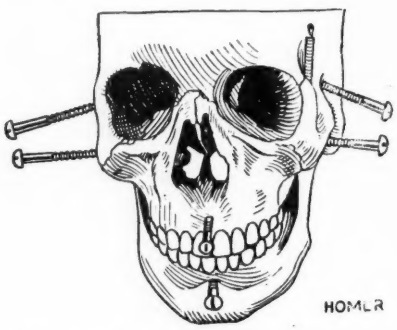


Fig. 1. — Plan on which the relator was based. The upper of each set of screws is stationary and the lower one is movable. One is in the symphysis and the other two are, one each, in the condyle.

The impressions are placed in the mouth (Fig. 7) (an articulator is used to show work clearly), one beak of the caliper is inserted in the intersection of the two lines scribed on the lower impression and the patient is asked to close until the other beak can be inserted in the intersection of the two lines on the upper impression. This will gage the amount of wax necessary to get the correct intermaxillary distance. Baseplate wax is softened, formed to the ridge and placed over the lower impression. The technic of the caliper is repeated, and when the upper beak has entered the intersecting point, the wax is cooled.

The surplus is trimmed away and the wax reseated on the lower impression, and the patient is asked to open and close repeatedly. Checking for shifting is carefully done. This gives the correct centric relation ("repeated identical closure of the mandible from a non-stressed position").

Determination of the proper intermaxillary space is an arbitrary matter. No two dentists would be able to get an identical space at a second or third trial, nor would the dentist himself, unless he uses the arbitrary measurement of the base of the nose to eyebrow and nose to chin for comparison.

The determining factors are (1) the dentist himself; (2) his judgment as to the mental frontal length of the face (this is largely influenced by the condition of the patient and the facial tissues), and (3) approval of the patient for feeling and appearance.

Even after every possible precaution, there may be dissatisfaction. Establishment of the plane of occlusion is also arbitrary. If we have a firm upper and lower ridge, the length of the upper lip determines the anterior position of that plane.

If the ridges are absorbed, the position of the plane is determined by the ridge that will stand the most leverage. If the lower ridges are shallow, it is best to lower the plane of occlusion as far as is consistent with esthetics; and vice versa, for the upper. No instrument has ever been devised to do our thinking for us.

We may have an artist's outfit, but that will never paint a portrait unless we develop the artist's eye and touch.

Thus, it is possible to articulate a set of teeth in three point balance and yet not have them function properly. I refer primarily to setting the teeth outside the ridges, or deep cusps, or excessive milling, resulting in a traumatic occlusion that is most harmful to the underlying structures.

I am convinced that a paper or clinic should give the difficulties involved as well as the statement regarding the success attained. We are too prone to boast and thus create a false impression of superiority in the minds of our fellow men.

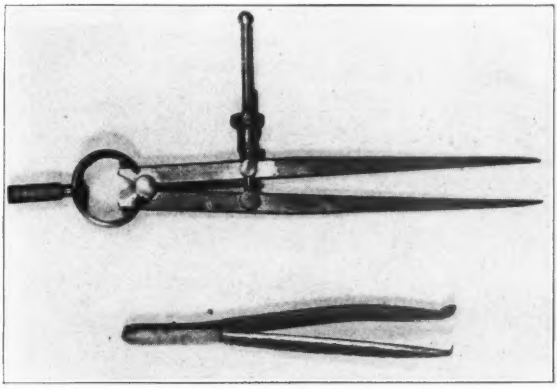


Fig. 2.—Dividers with a set screw and also scribing instrument.

This creates an inferiority complex in their minds when they encounter difficulties, and in the end is detrimental to scientific advancement.

Although not in accord with the teachings of Dr. Homer, I wish to offer an alternative and shorter method. After the original centric relation has been established by the method just mentioned, or any other acceptable method, the casts are mounted on the relator; but no compound is placed in the cups. The original relationship of the casts is maintained by setting the relator in centric relation.

Baseplates and bite rims are then adapted to the casts and a modified form of a horseshoe plate is attached to the lower rim. (Fig. 8.)

The form of the horseshoe plate is altered by widening it buccally in the molar region, on the left side. Two incisor path markers are then attached to the upper bite rim, one in the usual position at the median line and the second over the molar area on the left side.

The horseshoe plate is then prepared by waxing and carbonizing at the usual point and also on the widened portion. (These baseplates should, of course, be tried in the mouth for stability, correct centric relation and facial length before the foregoing preparations are made.)

The path-marker pins are dropped and the patient is instructed to make the lateral and protrusive movements. (Fig. 9.) Two rectangles are developed.

The rims are then sealed together and removed from the mouth and replaced on the casts. (Fig. 10.) The marker

pins are raised and the rims released. Warm modeling compound is then put in the condyle cups on the relator. The incisal path-marker and buccal path-marker pins are dropped, and the condyle paths formed in the soft compound by drawing the two path-marker pins respectively along the borders of the triangles.

This gives us the horizontal guidance of the condyle paths and the teeth can be set up to follow its direction. (Fig. 11.) The vertical guidance or the incisal inclination is obtained by following the original technic outlined by Dr. Homer.

arms in the compound negatives and developing the vertical guidance in the set up.

The trial plates are then fitted in the mouth and the checkbites taken. (Fig. 12.) The recording of the checkbite is one of the most important steps aside from the actual work of balancing the dentures.

The weak link in the chain is the checkbite. Stability of the bases is essential and the use of a retaining powder is a necessity in many cases. J. B. LaDue insists that it is necessary in every case, whether there is an evident movement

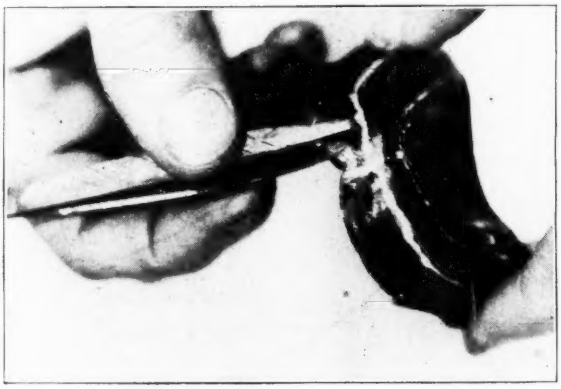


Fig. 3.—Marking the labial of the impression with the scribing instrument. The line on the labial shows the depth of the ridge impression, also the median line.

By the Homer method, the casts are first mounted on a simplex articulator and then the wax checkbites are used to obtain the vertical and horizontal guidance. The method of the gothic arch tracings eliminates a double mounting and requires far less correction in the "set up."

By following that method, the teeth are set for any typal arch form and overbite using the horizontal guidance as given by the movement of the condyle

of the base or not. I think that this is true, because even a base that has stability has movement on the resilient tissues underlying it. The retaining powder holds it firmly, so that the teeth, which are not yet in true balance, enter the wax checkbite with a firm and definite movement and make a correct record. This also applies to the completed dentures before milling, to correct the movement of the teeth during vulcanization. This method calls for little occlusal correction and

practically does away with milling outside the mouth.

The bases must be stabilized in the mouth and the centric occlusion should be correct. The teeth on the trial plates should occlude properly for an open and shut bite. The stability of the bases and also the occlusion should be tested by wedging the point of a penknife blade between the upper and lower molars to detect movement. There should be no movement.

One half sheet of impression wax is softened in the flame or hot water, and placed over the lower teeth, and the patient is instructed to give a right lateral bite. This wax is cooled *in situ,* and marked with an R, on the upper surface, to read from the front. The left lateral and protrusive bites are taken in succession and marked for future identification. The lateral movement should be at least the distance of one half the width of an upper incisor to right or left.

If the central occlusion was not correct, an additional registration must be taken for it. If the casts have been mounted on a plain or fixed line instrument they are now removed and mounted on the relator for balancing according to the individual condyle and incisor guide requirements of the case.

The two trial plates are reseated on the casts and sealed together. The lower cast is attached directly over the lower bow of the relator, and after the plaster has set, the upper is attached. If both are attached at the same time, the expansion of the plaster will open the bite. No facebow is used for mounting the casts.

I should like to have you realize that no particular care is required in mounting the casts on the relator. It is even possible to mount them with the face to the rear of the instrument, and when the registrations are made in the plastic compound, an analogous path to the individual path will be developed which will give us the same balance as though the casts were more conveniently mounted. This flexibility completely eliminates even a theoretical necessity for a facebow. In my opinion, no one has ever produced better work with it than can be produced without it, because

Fig. 4.—Marks on lower impression (compare Fig. 3).

the temporomandibular joint is not a pivot hinge.

Dr. Homer has coined the term occlusodontia as the science of positioning or relating opposing surfaces of teeth for the greatest efficiency of the individual, by arrangement, construction, alteration or root movement.

A short description of the relator seems opportune at this time. (Fig. 13.)

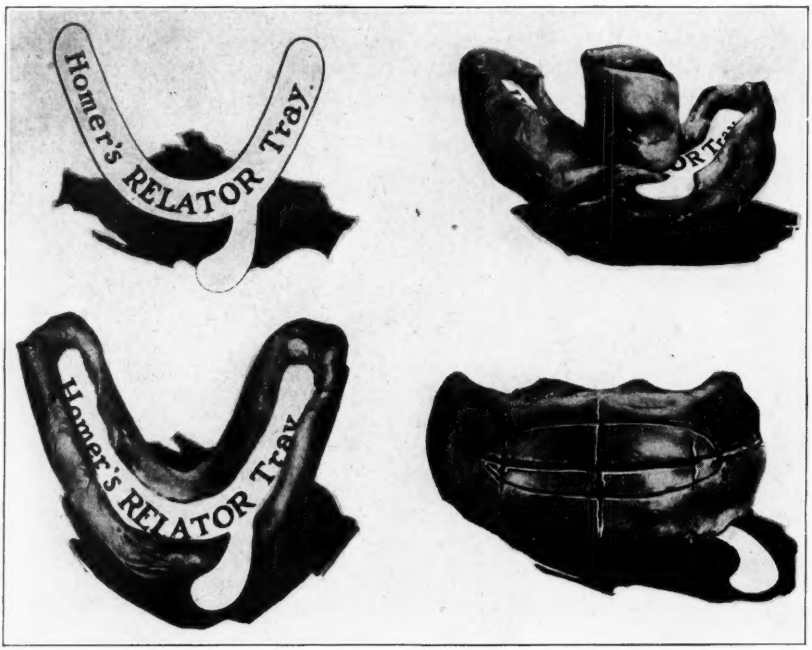


Fig. 5.—Method of building up the intermaxillary bite to determine the face form and central occlusion.

The relator is an instrument with a plastic and unlimited range of adjustment to record mandibular relations and but two movable parts. The relator permits reproducing mandibular movements from registrations in a material plastic at the time of registration. It is called a relator because the term "relating teeth" is more expressive than "articulating teeth." It is truly an adaptable instrument, and, as such, uses plastic material to get an unlimited range. It is advisable to oil the cups and condyle extensions to prevent sticking of the compound.

The three screws are set to the heads before the casts are attached. This puts the dentures in centric occlusion as far as the relator is concerned, and it is possible to return to centric occlusion at any time by resetting the screws. Modeling compound is now heated and both condyle cups are filled with it. Without changing the position of the screws, the

extensions on the relator, or condyle arms, are dropped into the plastic compound and the instrument is centered by the screw positions. The arms are oiled to prevent any drag in the compound when removing them for the next registration.

The cups are dipped into hot water (Fig. 14) to keep the compound plastic. The screws are raised and the R checkbite, after proper refinement, is placed over the lower teeth. Then the teeth on the upper trial plate are carefully placed in the upper part of the checkbite and slid to rest in that position. At the same time, the condyle arms are drawn through the plastic compound and form the path for this right lateral registration. If we desire to make but one registration, the compound can be cooled and removed and similar registrations can be made for the left lateral and protrusive bites. This would give us three separate sets of cups, each moving to and from central occlusion in that bite only. There is an instrument on the market that does that.

The relator is far more flexible in that all three registrations are made in the one compound negative. This duplicates all the lateral and protrusive and retrusive shifts of each individual patient, in one set of negatives.

It also eliminates the necessity of changing the compound in the cups or, as in Dr. Hall's instrument, of resetting the slots and recording dial markings. (Fig. 15.) The full record also helps in milling, in that we can mill to, from and past central occlusion, while Dr. Hall's instrument mills to and from central occlusion in each position, necessitating adjusting a number of screws and disks for each change of instrumental movement. Furthermore, I do not believe that the main requirement of an instrument for relating (or articulating) artificial teeth should be milling. Rather, it should have incorporated in it the convenience of positioning the teeth so that they receive the least mutilation.

Fig. 6.—Triangular pieces cut from the intermaxillary bite at the median line and the distance between the ridge crests measured.

To continue with the various registrations formed by the condyle arms while the compound is still plastic: After the central and right lateral registrations have been made, the R checkbite is removed and the L checkbite is placed over the lower teeth.

The compound in the cups is kept plastic by dipping the cups in hot water from time to time. Then, the upper teeth are carefully placed in the upper impressions of the checkbite and shoved to position. In the process, the condyle arms make the path for the left lateral bite, in the plastic compound. We now have the central and right and left condylar paths traced in the plastic compound.

The upper bow is removed once more; the central screws are again set to the head, and the upper bow is replaced in central occlusion and the compound cooled. Irregularities in the compound are corrected with "Kingsley finisher" if there should be any ridges between the registrations. The incisal cup is now filled with plastic compound and the different registrations are made from central through the right, left and anterior bites, with the same technic as for the condyle cups. The incisal registration helps to bring the instrument back to central occlusion at every movement, and also lifts the teeth to the bite on the opposite side from which the thrust was made. Therefore, the incisal cup guidance is essential for the original balance, but can be dispensed with when the milling is being done. If a cross-section of the incisal registration is made, it will show Gysi's gothic arch. The arch is in the form of a pyramidal depression. The sides are inclined to the correct incisal guidance.

Dr. Hall contends that a straight slot is all that is necessary to and from central occlusion for condylar guidance. (Fig. 16.) There is no controverting the statement that the condyles do not move in straight lines; nor do they follow any predetermined path. As Dr. Homer has pointed out, "Seldom do any two mandibles move so nearly alike that their movements can be interchanged for mechanical purposes, if best results are desired." All the authorities agree that the condyles do not travel in a straight

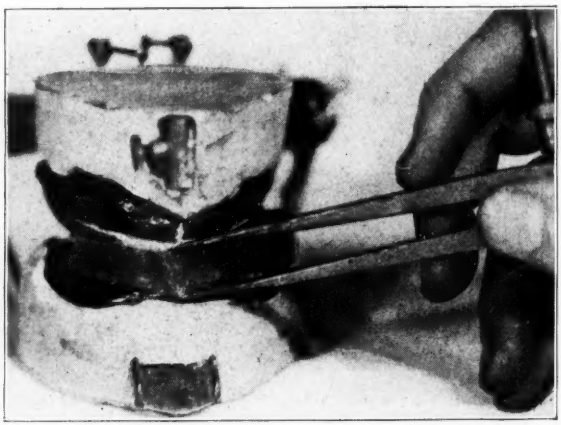


Fig. 7.—Impressions mounted on the articulator for demonstration, showing the method of obtaining central occlusion. The dividers are the same as in Figure 6 and points are placed in the intersection of median line and scribing on each impression.

line, but rather in the form of an elongated S. Dr. Gysi even made plates with S slots; but was forced to abandon this method because it required an expert diemaker to make slots for each case. (Fig. 17.)

The bolus of food has an influence on the position of the condyles because it tends to force the condyle on the working side up into contact with the glenoid fossa, while the lever action pulls the condyle on the opposite side from its contact in the fossa. Probably the checkbite has this effect on the condyles, and

Fig. 8.—Modified horseshoe plate, wider in the molar area on the left side.

Fig. 9.—Tracings with pathmarker released. The negative in the condyle cups are made by forcing the arms on the relator through the soft compound, their movement being controlled by the hand guiding the two pathmarkers in following their first tracing.

I have frequently put a double thickness of wax on the balancing side when taking the checkbite.

It may be possible and may seem reasonable to expect that small variations have little influence on the masticating efficiency of the patient, but we must not overlook the many and varied influences that the mucosa and underlying structures exert on artificial dentures. (Fig. 18.) Therefore, if the foregoing premise is accepted, i.e., that the condyle does not move in a straight line, I wish to propose the following axiom: Neither, then, is it possible to force it to follow a mathematically predetermined slot in constructing an artificial denture. Let us, for a minute, consider the many things that influence its movements. In addition to the movement of two arcs and a chord, there may be a side thrust in which the whole mandible shifts bodily to the right or the left. The movements of the lower teeth in mastication are not absolutely uniform, owing to unequal muscle action. The diagonal pull of the pterygoid muscles gives a direct lateral movement to the mandible, causing a bodily lateral shift of both condyles in their fossae. When we consider this thrust and realize that a shift from right to left is 180 degrees and that there are an infinite number of intermediary planes from one lateral thrust through the protrusive to the other lateral and then also the side shift, we realize that a plastic registration can be the only accu-

rate method. A fixed slot set for the direction may be accurate for that movement but that one only. And what about the hundreds of other possible movements?

Let us compare the plastic registration to the making of a phonograph record. The steel needle, actuated by the vibratory disk responding to the voice, makes an irregular line on the surface of the wax plate; a vulcanite record is made of this line, and, from this, we can reproduce the original peculiarities of the voice.

Fig. 10.—The tracings. The upper arm of the relator has been raised.

No mathematical device can make the line on a phonograph record. So the infinite and imperceptible variations of the individual condyle paths can be reproduced only in a plastic material with the aid of the checkbite and an instrument such as the relator with only two moving parts.

If we have proved the possibility of obtaining an accurate tracing of the condyle movement, the remainder is purely a technician's task: merely transferring this movement into the appended dentures.

The proper compensating curve is now worked out as follows. (Fig. 19.) Place one beak of a pair of set calipers at the tip of the distobuccal cusp of the upper second molar and mark the lower cast with the other beak vertically beneath it. Using the guiding planes established in the incisal and condylar pieces of compound, push the teeth into the balancing bite on that side and again mark the plaster vertically beneath the distobuccal cusp of the second molar. Connect the

Fig. 11.—Lower baseplate, bite rim and horseshoe plate. The rectangular tracings show plainly.

two points on the plaster, registering the protrusive condyle path as obtained by Dr. Gysi. This line gives the saggital inclination angle for the buccal cusps of the second molar. The wax around the second upper and lower molar is then softened, and the combined axis of these teeth is tilted at right angles to the line just drawn on the lower case, and then balanced for working and balancing bites.

The second molars on the opposite side are similarly treated, and from that, the balance for the denture is easily worked out. (No matter how good the technic or how nearly perfect the instrument, unless the operator has skill, the case will not be so good as it should be.)

There is a radical difference between the working or balancing bite in the average natural dentition and the same relations as exhibited in artificial dentures.

In nature, the lingual incisal slope of the cuspids serves as a guiding plane to a scissors and milling movement resulting that will exercise and thoroughly triturate the toughest foods. Therefore, every effort should be made to avoid deep cusps, which, although milled to perfect opposition and contact, are serviceable only as long as the bases remain in the same relation to each other.

However, owing to unstable support, the dentures shift more or less. Then the deep cusps become a source of interference and cause traumatism to the underlying tissues through the horizontal shift of the dentures.

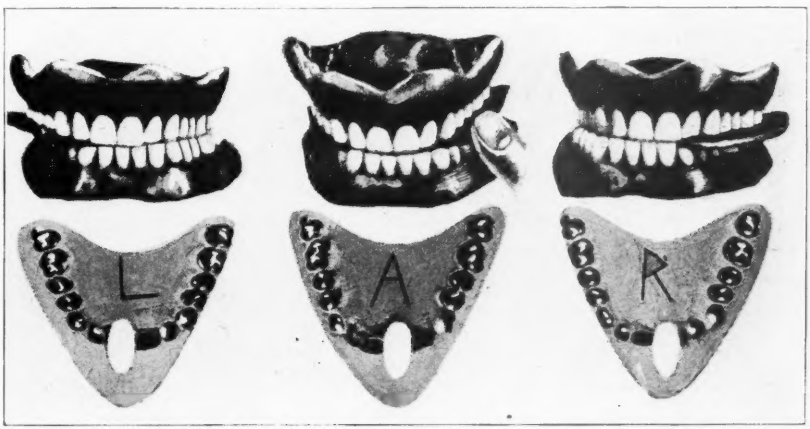


Fig. 12.—Method of preparing relator registers.

bring the bite back to central relation on each excursion of the mandible. Furthermore, we seldom find balanced occlusion in the natural dentition. The artificial denture, therefore, must be constructed on different lines.

The greatest efficiency is obtained when the teeth are placed in such position that every lateral or protrusive movement of the mandible will allow the planes and facets on all opposing surfaces to slide without interference,

Finally, teeth with deep cusps milled to perfect opposition have no escape vents for the food. The food packs into the sulci and prevents efficient mastication.

DISCUSSION

Charles J. Sozzle, Rockford, Ill.: When I was asked to discuss Dr. Hosper's paper I naturally supposed it was to be on the details of construction of artificial dentures. The subject itself would hardly indicate this. For me to attempt to discuss the relative merits of the "relator" would be absolute folly. According to Dr. Hospers, "It is the only truly

adjustable instrument in existence today." I question this. I have no doubt as to the advantages of this instrument designed by Dr. Homer. I envy the man who can successfully master any one of the many wonderful instruments at our disposal. But a more simplified technic with attention to details must be resorted to if we desire to more than attract the attention of the great majority. I am satisfied that these specialists are sincere in their endeavor to maintain a high standard of efficiency. At the same time, I cannot overlook the fact that they are seriously disregarding many of the important details that are more essential to the comfort of the patient. As a student of nature, may I offer a few suggestions that have been most helpful to me in my endeavor to serve my patients satisfactorily. In the first place, it is my belief that many of our denture specialists place entirely too much stress on the mandibular movements and the condyle paths. This mandible of ours is about the most accommodating part of our anatomy and, as has so often proved, will adjust itself to almost all kinds of abuse. At the same time, the proper relationship of the mandible to the maxilla is one of the important details, although we now have teeth so designed as to modify this requirement. The condyle paths are whatever the operator chooses to make them, depending entirely on the opening of the bite and on the grinding of the cusps. They may be flat, shallow or deep, but must be ground at a uniform angle. Dr. Hospers recommends the use of modeling compound as trays to work upon.

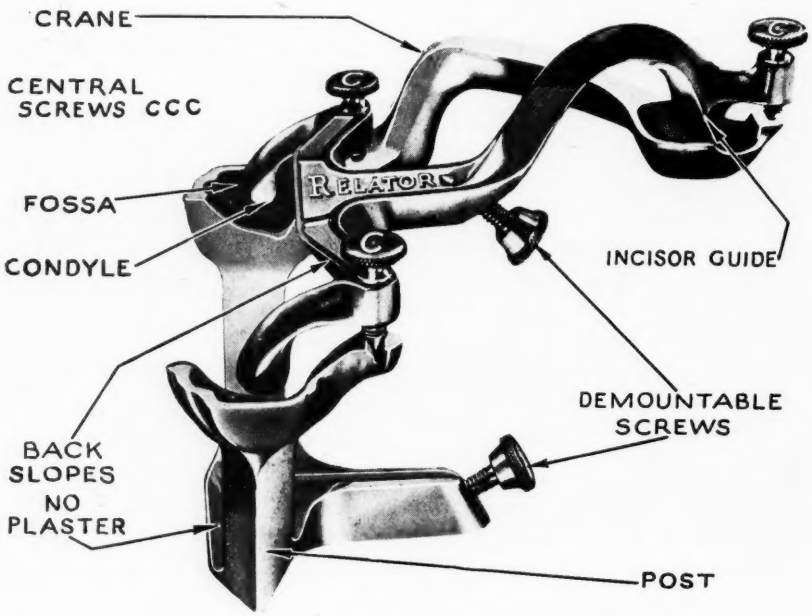


Fig. 13.—Relator.

I have ceased long ago to find any substitute for vulcanite trays. I assume from the paper that he has no definite plan of distances, other than the eye and the lip line. If there is anything more deceiving than the eye, I do not know what it is. If you think the lip line is the same one, two, three weeks or six months after extraction, take measurements before and after to convince yourself to the contrary. Why not do a little measuring and a little proportioning from nature itself? I am speaking only of people with natural teeth whose

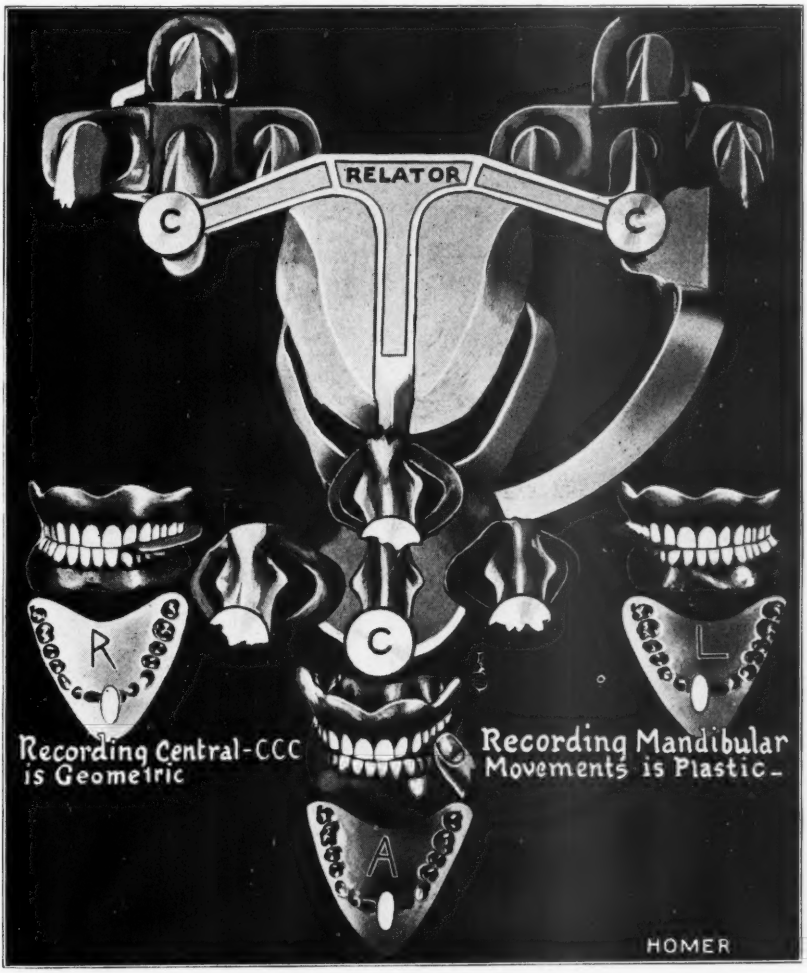


Fig. 14.—Relator.

features are ideal and appeal to us from the esthetic standpoint. The correct opening of the bite has everything to do with the proper leverage. The length of the teeth and the right proportion has everything to do with esthetics. The arrangement of the teeth on the mandible has everything to do with the seating of the lower denture, the bane of the dental profession. Then, why not give some thought and study to these details rather than the condyle path, the mandibular movements and some complicated instrument that no one but a professor of geometry and trigonometry could successfully comprehend in the course of half a century? Study the features, take molds, shades and measurements before the teeth are removed. Proper mouth preparation is very important. Measure people with natu-

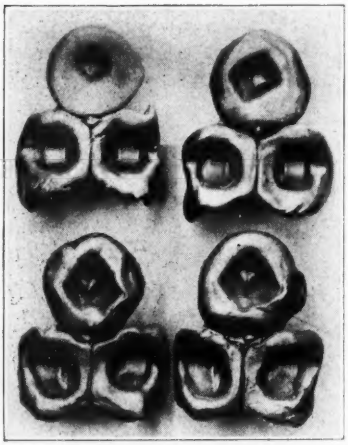


Fig. 15.—Change in negatives from central occlusion through all steps.

ral and good sets of teeth and I have no doubt you will find, as I have found, that, in the great majority, the distance from the nasiolabial angle to the lower border of the mandible at the median line should equal the distance from the nasiolabial angle to a line drawn along the top edge of the eyebrows (a suggestion offered by Dr. Gillis). If this is true, why not use this measurement only as a guide? We must know what this distance is to determine what the length of the upper and lower teeth should be to afford the proper esthetic results. The simplest and most satisfactory way to obtain the proper relationship of the mandible to the maxilla is to take impressions and employ vulcanite trays. Add rims to these trays and trim both for length and proper closure. Stand directly before the patient, placing the forefinger of either hand on top of the lower rim in the molar region and ask the patient to close on your fingers. Repeat this operation several times, withdrawing the fingers laterally. When the two flat planes come in contact, ask the patient

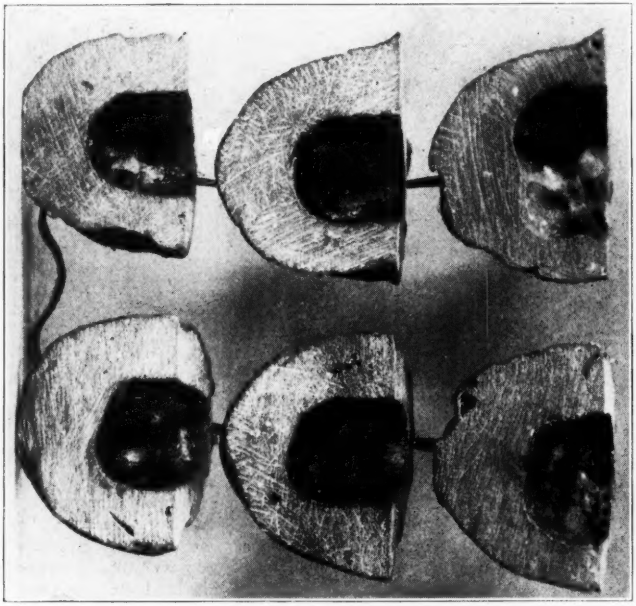


Fig. 16.—Various forms of paths in the compound negatives.

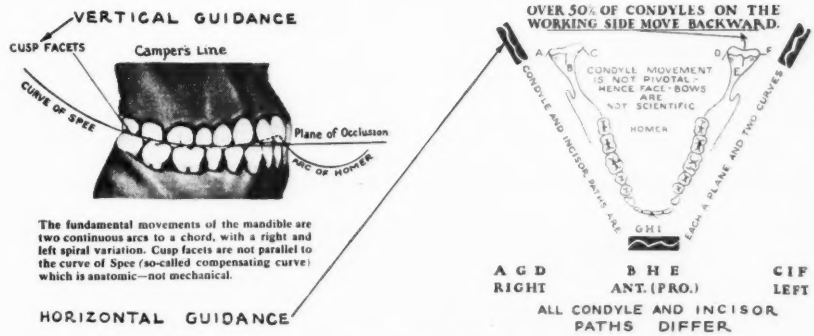

VERTICAL GUIDANCE
CUSP FACETS
Camper's Line
CURVE OF SPEE
Plane of Occlusion
ARC OF HOMER
The fundamental movements of the mandible are two continuous arcs to a chord, with a right and left spiral variation. Cusp facets are not parallel to the curve of Spee (so-called compensating curve) which is anatomic—not mechanical.
HORIZONTAL GUIDANCE
OVER 50% OF CONDYLES ON THE WORKING SIDE MOVE BACKWARD.
CONDYLE MOVEMENT IS NOT PIVOTAL - HENCE FACE-BOWS ARE NOT SCIENTIFIC
HOMER
CONDYLE AND INCISOR PATHS ARE EACH A PLANE AND TWO CURVES
A G D
RIGHT
B H E
ANT. (PRO.)
C I F
LEFT
ALL CONDYLE AND INCISOR PATHS DIFFER

Fig. 17.—Control of mandibular movements by condyle paths and arc of Homer.

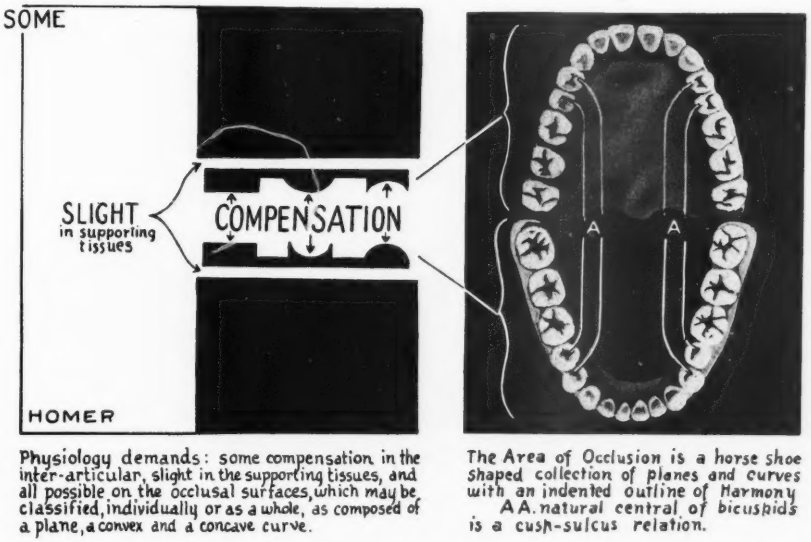

SOME
SLIGHT in supporting tissues
COMPENSATION
HOMER
A
A
Physiology demands: some compensation in the inter-articular, slight in the supporting tissues, and all possible on the occlusal surfaces, which may be classified, individually or as a whole, as composed of a plane, a convex and a concave curve.
The Area of Occlusion is a horse shoe shaped collection of planes and curves with an indented outline of Harmony AA. natural central of bicuspids is a cusp-sulcus relation.

Fig. 18.—Profile tissue relation diagram of artificial or natural masticating machine.

to swallow. If they can swallow in comfort, you may rest assured that you have accomplished your purpose. Carrying the mandible as far posteriorly as possible is in some cases wrong. If you do not believe this, those of you who have natural teeth bring the teeth into proper contact and swallow. It is done with perfect ease. Now, thrust the mandible forward, backward or laterally in either direction, and then try to swallow, and note the results. Examine any mandible, and I think you will find that, in the great majority, the molars and bicuspids are on the inside of the ridge and the anterior teeth on top of the ridge. From an esthetic standpoint, the length of the lower ridge is the important feature. The occlusal planes of the molars and bicuspids of the lower should incline toward the lingual aspect. Many offer an objection to placing the molars and bicuspids on the inside

of the ridge, complaining that there is not sufficient room for the tongue. We realize that the tongue must have plenty of room. If it doesn't secure it laterally, this must be accomplished by opening the bite to its proper distance. Did it ever occur to you that there are only two causes for the destruction of alveolar process, disease and pressure? Therefore, why not properly prepare the ridge and the palate. To prove this, take an edentulous patient who has been going without dentures for years: the ridges are entirely gone. With a patient wearing a full upper denture with six lower natural anterior teeth, the anterior portion of the upper ridge is entirely gone and two large posterior ridges still remain. The denture stands at an angle, owing to the excess pressure anteriorly.

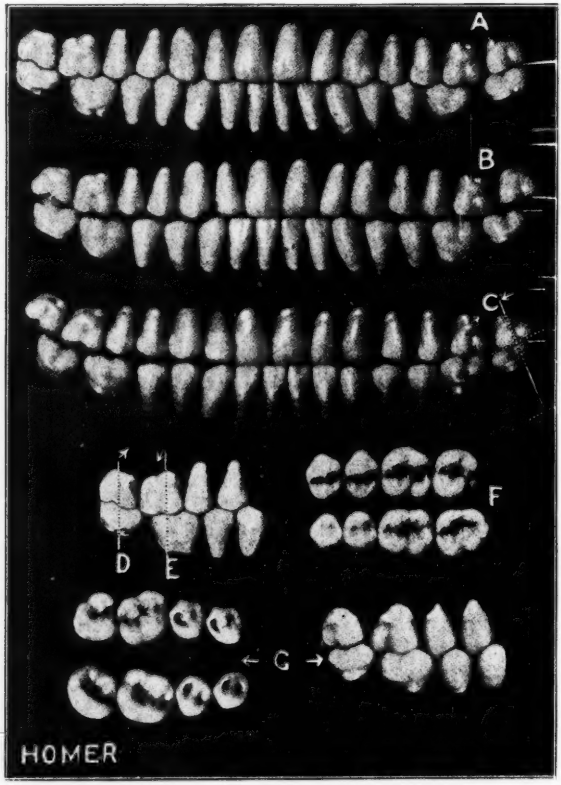


Fig. 19.—Angulating artificial cusp facets.

mouth for the insertion of a denture as you would a cavity to receive an inlay, all undercuts being removed with a uniform foundation that will permit equalized pressure on the bony structure, thereby minimizing absorption. If we wish to preserve the ridge, it must be done by eqúalized pressure on the

Why not profit from these experiences and take impressions with closed mouth and under the stress of masticatory force? I have followed this technic for more than ten years. I have dentures of long standing, made from ten days to three weeks after the teeth have been removed and the mouth has been prop-

erly prepared, that have settled less than 1 mm. They are still giving excellent service. I make all my dentures after applying the measurements. Why should there be any great difference in the length of teeth in a normal mouth when we stop to consider that from a 7 to a 7¼ hat will fit nearly any man in the room? I am sorry I could not more intelligently discuss the merits of this instrument known as the "relator." I apologize to Dr. Hospers for this ignorance on my part.

Rupert E. Hall, Chicago, Ill.: The principle of recording and reproducing mandibular relations with a plastic material belongs to C. E. Luce, of Stuttgart, Germany, and not to Homer. Figure 20 shows the Luce articulator as disclosed in his patent, together with the two claims granted to him in 1910. If one questions the impracticability of the Homer plastic principle, let him take the eccentric occlusion wax bite registrations of a set of finished dentures, or of a set of natural teeth, and mount the teeth in the Homer relator to the centric occlusion of the teeth, according to the split demountable cast test method used by the National Society of Denture Prosthetics, as devised by Needles (Figs. 21 and 22), and make a set of composite negatives according to the eccentric bites. When through, let him see whether the centric occlusion of the composite negatives, the first negative made, agrees with the centric occlusion of the teeth, checking back to the starting point, the basis of all of the negatives. Because of distortion, expansion and shrinkage of the compound in making the composite negatives, the first negative made, that of centric occlusion, will be observed to have been modified and rendered unfit for use as a guide with which to arrange and grind in centric occlusion, the basis of all of the occlusions. Furthermore, any inaccuracy in the centric negative is reflected in the eccentric negatives, and, as a result of these discrepancies, this principle of recording and reproducing mandibular relations and movements is shown to be inaccurate and imprac-

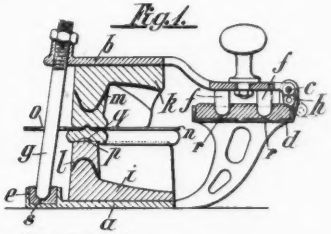
C. E. LUCE.

ARTICULATOR FOR MAKING ARTIFICIAL DENTURES.

APPLICATION FILED SEPT. 28, 1910.

1,009,912. Patented Nov. 28, 1911.

Fig. 1.



What I claim is:

1. In an articulator, the combination of an upper part, a lower part, disks adapted to receive plastic material and carried by one of said parts, and rounded pins carried by the other part and adapted to form impressions in the plastic material to provide a guide-path for the transference of the masticatory movement.

2. In an articulator, the combination of an upper part and a lower part, means provided on the lower part for receiving plastic material, and an adjustable guide pin carried on the upper part forming an impression in the plastic material.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES E. LUCE.

Fig. 20.—Luce articulator.

ticable. It was observed in Dr. Homer's demonstrations in Chicago that he encountered this difficulty, and that he appreciated the seriousness of such inaccuracies was proved when he attempted to rectify them by modifying the composite negatives with a hot spatula after I examined the centric of the negatives and called his attention to the fact that the centric was not accurate. The split cast test method was used by the National Society of Denture Prosthetists for testing the ability of articulators to check bites accurately and to reproduce positional relations of the mandible. Two consecutive meetings of the above-named society, held at Los Angeles and Cleveland, were given over to testing articulators, with the result that no articulator tested at that time was sufficiently adaptable to check bites accurately. The split cast test, devised by Dr. Needles, is a very accurate as well as a very simple means of testing the accuracy of an articulator. Figure 21 shows the cast of the upper teeth demountably mounted upon a base of plaster forming a keyed seat. The cast is secured to the keyed seat by means of a nut and bolt, embedded in the mounting plaster carried by the cast and the bolt passing through the frame of the articulator and plaster forming the key seat. The bolt and nut permit ready removal or replacement of the cast. In using the foregoing method for testing the adaptability of an articulator, the upper cast is demounted, the teeth are fit into a wax bite of the positional relation of the mandible with which it is desired to test the instrument and the upper arm of the articulator is closed, the two plaster counterparts being brought into contact. If the articulator is truly adaptable, the surfaces of the two plaster counterparts will come together in perfect apposition; whereas, if it is not, there will be a failure of the surfaces to come together in perfect apposition. The test suggested and outlined for the Homer relator follows: On completion of the composite negatives, demount the upper cast and position the teeth in centric occlusion and, guided by the centric negative, forming the hinge, close the articulator bringing the surfaces of the plaster counterparts together and note whether they come together in perfect apposition. The chances of the surfaces coming together in perfect apposition are very remote, and, in their failure to do so (Fig. 23), the plastic negative principle is proved to be inaccurate and impracticable. A favorable result is possible and may be shown in a certain test or in one especially made to discredit the claim that the principle is not accurate and practicable, but, as a method for every day use in

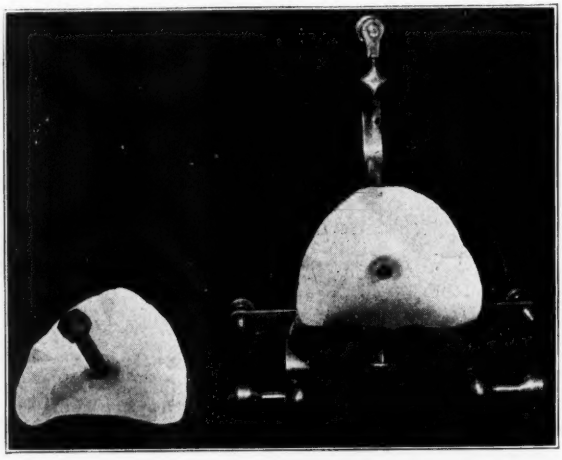


Fig. 21.—Upper cast mounted according to the test method of Needles.

regular practice, the principle will fail to prove sufficiently accurate and dependable to be practicable. Any discrepancy shown because of failure of the plaster counterparts to come together represents to what extent centric occlusion (the bite) has been thrown off and also indicates that the eccentric negatives are likewise and correspondingly inaccurate.

Dr. Hospers (closing): In the first place, I want to tell you that nobody has ever "stumped" me. Also I do not intend to do this, because I would never accept a proposition like that unless I knew exactly what I was assuming. It is a simple matter to deliberately set a trap for anyone but a due amount of caution should be used before

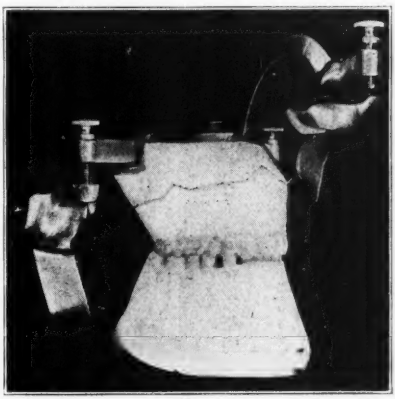


Fig 22.—Upper cast shown in Figure 21, demounted.

accepting it. Dr. Hall said that there was a nut in this plaster. It would not surprise me to find a nut in any of Dr. Hall's plaster. I am not afraid to make this test and will gladly do so at some future time. I have nothing to gain by proving it right or wrong. In my hands, this has been a satisfactory method of setting up artificial teeth, and I am passing it on to the profession. Like a missionary, I am preaching the gospel of plastic articulation, in a land full of mechanical articulators. A new method is needed, but people do not want to change. When they will finally accept it, I will be hailed as a prophet. There are other instruments that are rendering excellent service and it is not necessary to speak derogatorily about them. At one time, I was an advocate of the Gysi adaptable articulator. Mr. Hanau, regardless of Dr. Hall's remarks, has one of the finest instruments that is on the market today. It is a geometric instrument, and requires a mechanical adjustment. As has been stated, however, the relator is more adaptable than all articulators on the market today. I thoroughly appreciate the test that has been proposed. If this has been the test that has been applied to other instruments, I would like to try it out. I am not afraid of an honest test. Dr. Sowle told us a story about wasted energy, i.e., telling a hair raising story to a bald headed audience. That was certainly a slur on the audience. I believe that my story was told to a sympathetic and intelligent audience. Perhaps he inferred that he could not discuss the paper, not being acquainted with the technic. He said, "We need a more simple technic." I have scientifically described a technic that anyone can learn. He also said, "No one can comprehend the instrument." I can explain it to him in thirty minutes. Dr. Hall said, "No instrument will ever reproduce the movements of the mandible." I know that this instrument does. I have here two impressions of my own teeth. Attached to the lower is a horseshoe plate, and to the upper, in the median line, an incisor pathmarker. I produce not a gothic arch marking alone, but also an angle that is filled with a number of lines following the direction of the sides of this triangle. That is exactly the thing that cannot be reproduced on a mechanical instrument, but can be reproduced by the relator. Dr. Hall said that the weak link was the wax checkbite. I know it and have already so stated in my paper, and that is the reason for the horseshoe plate and incisal and lateral pathmarkers. He further finds fault with the technic because we are dependent on a plastic material. Modeling compound has been used for impressions for years and has always answered the purpose. Why not here? He said that there was a nut in the plaster. I am willing to crack it; but not today.

LATER COMMENT

Dr. Hall: In discussing Dr. Hosper's paper on Homer's articulator before the Illinois State Dental Society in Springfield, Ill., in May, 1929, I made the statements con-

tained in this discussion and challenged Dr. Hospers to make the test outlined, using my case, I having previously prepared and mounted casts of my teeth in the Homer articulator for the meeting. Dr. Hospers declined to make the demonstration, stating that he suspected a trick of some kind. Since the meeting, I have succeeded in getting him to make the test. The result of the demonstration was exactly as I anticipated. When the compound hinge (centric negatives) were caused to direct the closure of the instrument, the plaster surfaces failed to come together, presenting a discrepancy in the identical manner shown in Figure 23. Gale M. Hambleton, of Chicago, witnessed the test as made by Dr. Hospers and observed the result here reported. After deliberating over the result of the foregoing test, Dr. Hospers called me on the phone and informed me that he had me down on "that" test and I must be careful as to what I reported—that I had malocclusion, and if I would get a full mouth set of roentgenograms of my case, he would show me something. I answered him that my understanding had always been that occlusion of the teeth primarily was supposed to be studied and diagnosed with articulators rather than roentgenograms and suggested that I call in a patient with full dentures and mount his case in the Homer articulator and let Dr. Hospers repeat the test under conditions entirely controllable with the Homer instrument, which he claims to be the only truly adaptable articulator. To this he agreed and the second test was made, with the identical result of the first. (Fig. 23.) At the close of the demonstration, Dr. Hospers stated that it was not his work anyway, but belonged to Homer. That Dr. Hospers might from this point on know just what a "truly" adaptable articulator is expected to do and can do, I gave him a demonstration and showed him how perfectly and how easily the discrepancy shown in Figure 23 was prevented or eliminated with the Hall three dimensional articulator. I provided Dr. Hospers with one of my three dimensional articulators to test when I first brought it out and he returned it unused.

Fig. 23.—Plaster counterparts, showing failure to come together in perfect apposition.

Dr. Hospers: In the discussion of the foregoing paper, Dr. Hall submitted the technical test that was to have been made before the Springfield audience. This test would have taken a great deal of time and no provision had been made in the program for it. I therefore refused to accept it, and not because of fear of failure. As outlined above in Dr. Hall's discussion, we have since made two tests, both of which have proved to my satisfaction that the plastic principle is a safe one to follow. These tests have shown me that there was traumatic occlusion in both cases. One was the test as described by Dr. Hall and shown in Figures 21-23. The other involved a full upper and lower denture that

had been worn for some time. Many of the molar and also anterior teeth were fractured owing to interference. Dr. Hall refused to acknowledge this and said that the heavy jaws of this patient would stand anything. Twenty years from now, it will be a different story. The relator showed this fact distinctly. Dr. Hall was correct in his surmise that I suspected a trick, and I wish to show where the fallacy of this trick lies: 1. He is trying to adjust an adaptable instrument to a mathematical formula; but his premise is not mathematical. 2. In the first test, plaster casts of his mouth several months old were used and wax checkbites were taken at the time of the test. Only the slightest points of contact showed through the wax, which made it very difficult for me to complete the negatives. However, I accepted the challenge. 3. It is common knowledge that plaster changes its form materially in time, and that constituted another uncertain factor. 4. If Figure 23 is carefully studied, it will be noted that there is a marked mesial tilt to the lower second molar. This same condition exists on the other side. The relator showed a necessity for occlusal relief and I claimed that there was a traumatic occlusion and asked Dr. Hall to have a roentgenogram made of his teeth. This he refused to do. 5. He claimed that the slight discrepancy evidenced between the rest position of the condyles in the negatives and when the central screws were set showed the inaccuracy of the method. The force of closure on the wax negatives causes a temporary displacement of the soft tissues and is accurately registered. 6. The separation between the cast and the mounting (Fig. 21) was irregular in form with a large oval elevation in the center. It was set at an obtuse angle to the radius of the mounting, which made the oval portion very prominent. (This shows slightly in Figure 21). It is not mathematical. When the screw (Fig. 21) was removed and the instrument closed of its own weight, it would close accurately. In the test, however, Dr. Hall grasped the incisor set screw and closed it, easily forcing the halves of the oval to interfere and causing the split or separation as shown in Figure 23. In order to demonstrate this apparent discrepancy, he has shown clearly that he does not understand the relator, or he has made a mistatement. In Figure 23, the central screws are set except the incisal. This one has been unscrewed and the incisal cup filled with compound to elevate the front part and cause the separation. That was done to make the test appear as a failure. If this test was fair, no change would be found and the parts of the cast would be in direct contact.

DENTAL DISEASE AND ITS RELATION TO THE LOSS OF HUMAN TEETH*

By PETER J. BREKHUS, B.A., D.D.S., Minneapolis, Minn.

THE effectiveness of modern dentistry has been challenged from time to time by the leaders in the profession. In spite of the perfection of technic and materials, dental diseases are on an increase, and the mortality is so high that the major portion of the time of the dental profession is consumed in manufacturing substitutes for natural teeth.

The reason for this is the fact that, with a mechanical mind and with mechanical means, we have been dealing with biologic problems. Edward C. Kirk

*Read before the Research Session at the Sixth Annual Meeting of the American Association of Dental Schools, Chicago, Ill., March 26, 1929.

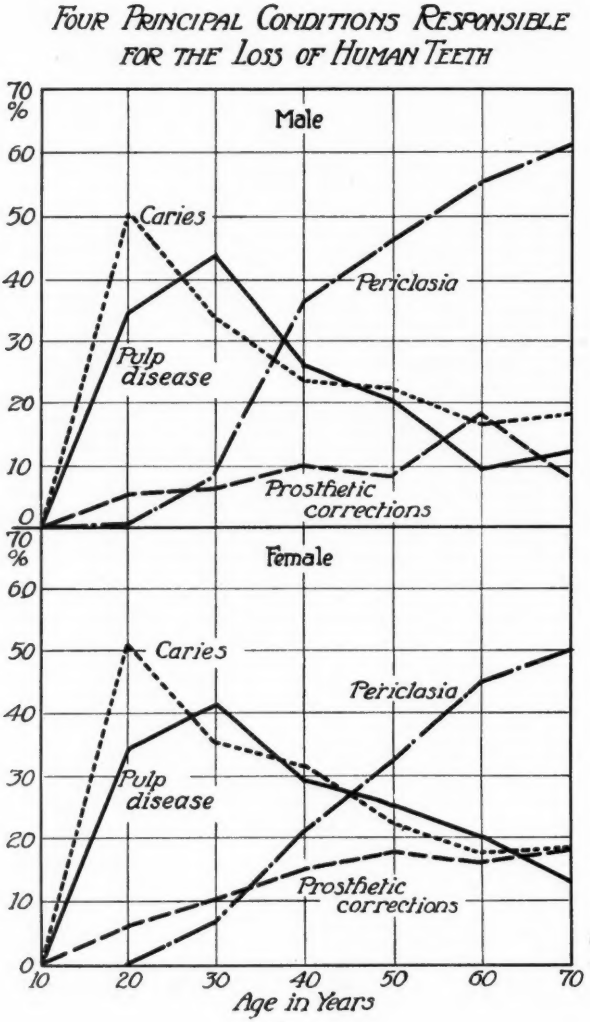


Fig. 1.

expressed this beautifully twenty-two years ago.[1]

1. Kirk, E. C.: The Vital Side of the Dental Problems, Dent. Rev., 21:557 (April) 1907.

Is it compatible with the claims that we make for ourselves, our scientific advancement, our learning, our manipulative skill, that we have done so little in the domain of preventing the diseases which it is our province to treat, all because we know so little

about the *remote and intimate causes of them?* Is it not high time that we rise to a higher conception of our mission as servants of humanity and develop a more earnest and sympathetic attitude toward the kind and extent of work necessary to solve some of the *foundation problems* that the vital factor in our professional work imposes?

In enlarging on the vital factors he goes on.

The problems of tooth loss and tooth destruction are dental problems, but because they involve the vital factor, then for this solution must be brought to bear all that is to be known of the development of vital action, cell activity, nutrition, physiological chemistry, and the whole group of correlated subjects necessary to the understanding of the vital factor.

This challenge was made twenty-two years ago by the dean of the Dental School of the University of Pennsylvania. How do matters stand today? Have we a better understanding of the vital factors, or are we still groping in the dark? If we are, is it not because we have failed, according to Dr. Kirk "to develop a more earnest and *sympathetic attitude* toward the kind and extent of work necessary to solve some of the foundation problems that the *vital factor* in our professional work imposes"?

I think you will agree with me that the attitude of the dental profession toward research in dentistry has not been so sympathetic as might be desired. The attendance at the discussions of scientific problems at dental conventions has been rather small and the audience indifferent, while clinics demonstrating some technical short cut to greater profits have

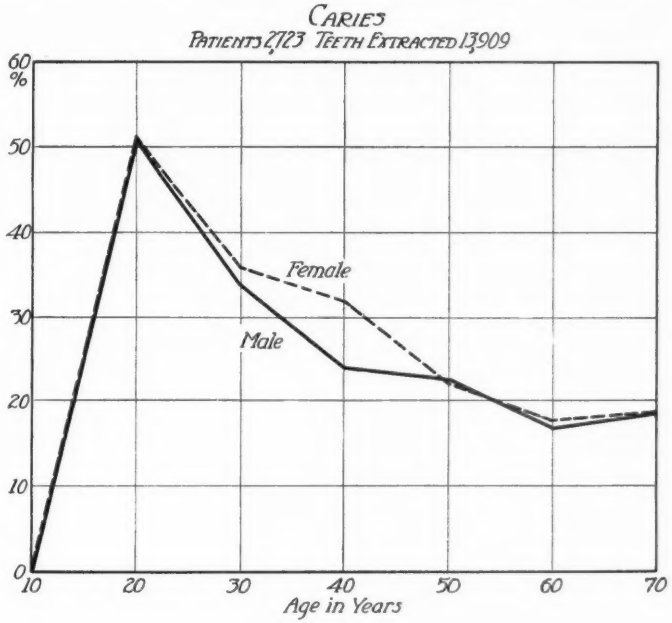


Fig. 2.

attracted large and enthusiastic audiences.

This attitude of mind may, according to the Carnegie survey, be charged to dental education. From page 3 of this report, I quote:

After centuries of cumulative refinements of its methods, dentistry has become, in the main, the art of realigning, repairing, rebuilding, and removing teeth, remedying diseased conditions within the teeth and in tissues immediately adjacent to them; and replacing, functionally and esthetically with artificial substitutions, the teeth or parts of the teeth that have been lost or removed. The last of these phases long seemed to be the most important utility of the practice of dentistry, which, by reason of its *outstanding reconstructive* character and its *minor evidence* of *curative quality,* appearing to be a specialty of applied mechanics with only an incidental relation to the art of *healing.*

From page 14 I quote further:

The outstanding deficiency of the science of dentistry has been its inability, hitherto, to discover methods for the general prevention of decay of teeth and of diseases of the closely adjacent tissues. Scientific establishment of adequate means to this fundamental end would revolutionize the practice of dentistry by eliminating the chief present occasion for it. Although these disorders are among the most common of all bodily ailments, they have received little attention from medicine. Dentistry, deeply absorbed in oral mechanics, and not versed in oral medicine, has been baffled

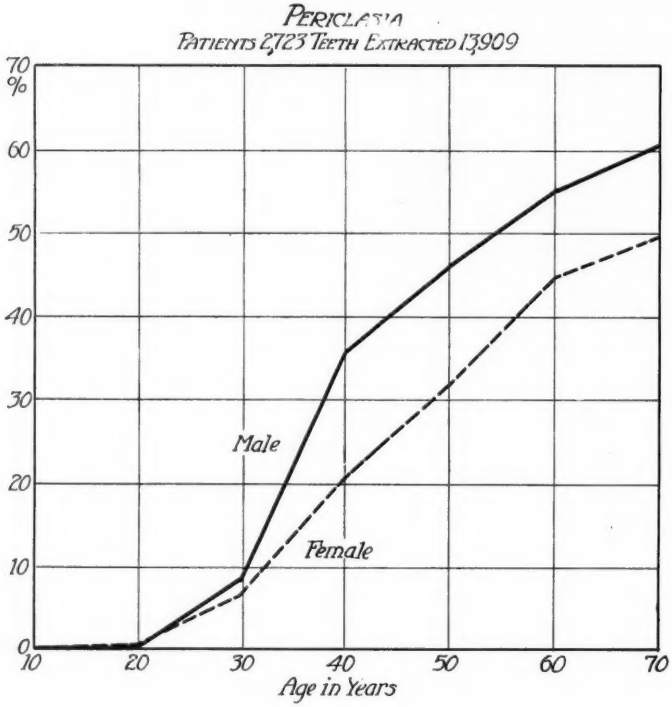


Fig. 3.

by them, and, until recently, has been content to follow with repairs, reconstructions, and replacement. The primary causes of dental decay and of periodontal disease appear to be hidden in the biological secrets of the conditions or processes of dentition, nutrition, coordination, or oral variability. It seems probable that the causative influences, whether related to dental development, impaired nutrition, disco-ordination, or particular conditions of dental environment, or to all of them, will not be discovered until the medical sciences are used effectively to this end. Comprehensive and penetrating research in these relationships is the basic need for the universal promotion of human welfare.

If this purpose is to be accomplished, I feel with Dr. Kirk that the first step is to develop the *sympathetic attitude* in the dental profession (especially in dental faculties); the second, to develop this attitude in the medical profession ("Even research in dental fields is regarded in important schools of medicine as something *intrinsically inferior*)."[2] We must also enlist the sympathetic attitude of the wealthy benefactors of society.

I cannot refrain at this point from commenting on the fact that dentistry has always been treated as the stepchild of the medical arts at the distribution of endowments. While large sums of public and private money have generously been contributed for research in the several fields of medical science, dentistry has had to content itself with the few crumbs contributed from the meager treasury of dental societies. The chief function of dental schools has been to educate dentists to do repair work. Funds, facilities and interest in dental research have been conspicuously absent.

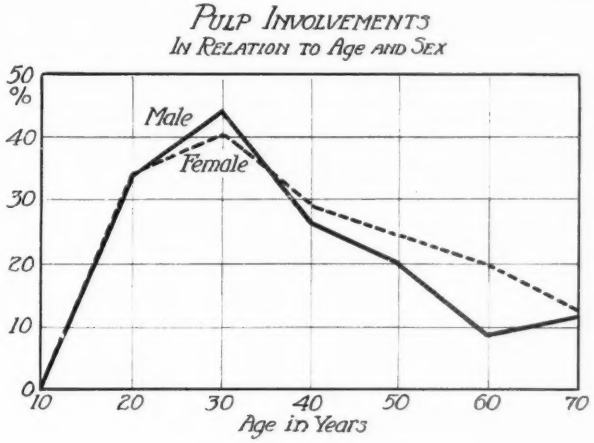


Fig. 4.

The underlying reason for this attitude, I feel, is the lack of appreciation of the seriousness of the problem of dental disease in relation to public health. It has from time to time been forcibly emphasized by leaders in the profession, such as Hunter, Mayo, Miller, Murphy, Kirk, Owre and a host of others. Some effect there has been, no doubt; but it takes patience and perseverance to move mountains.

2. Carnegie Survey on Dental Education, page 9.

The seriousness of the problem was appreciated during the World War when thousands of men were incapacitated for service on account of defective teeth.

The economic phase of dental health as a factor in efficient service is recognized by large employers of human labor all over the country, in establishing dental service for their employes.

The economic phase of dental health has also been recognized in education. Defective teeth have been regarded as a considerable factor in retarding the progress of children in the public schools. That dental disease is considered a health problem has been well illustrated by the fact that about one-third of the patients between the ages of 35 and 55 come to the dental clinic at Minnesota not to have teeth repaired, but for health reasons. The same thing, I expect, is true in private practice. With all these factors in evidence, we hope that the seriousness of dental disease will soon be fully recognized, and that dentistry will receive its just share of support in carrying out its much needed research. I probably owe you an apology for these reflections, somewhat remote from my subject, but feeling that they form a fitting frame for the picture that I am about to present, I have taken the liberty of indulging in them.

During the past five years, we have conducted statistical investigations on dental conditions among the patients at the dental clinic and among students at the University of Minnesota — two widely different groups. The problems studied are: 1. Loss of teeth. 2. Dental disease in its relation to loss of teeth. 3. Frequency of dental caries among 3,346 freshmen students.

The investigation on loss of teeth covering 9,450 patients was completed in 1926, and the findings reported to the

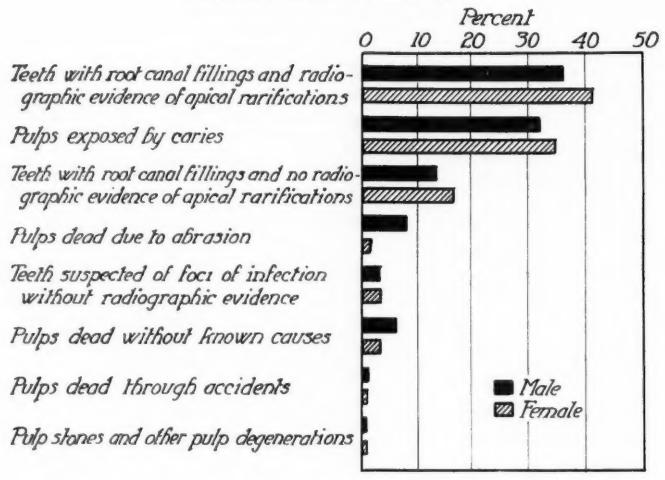


Fig. 5.

International Dental Congress in Philadelphia in August of the same year. It was published in part in April, 1928,[3] and has since been published in full by the University of Minnesota Press.

The investigation of dental disease in its relation to loss of human teeth was completed last June and reported before a small group at the national dental convention in August.[4]

The investigation of frequency of dental caries among 3,346 university students has just been completed, but no report has been made.

In the investigation of dental disease, we have recorded the diagnosis of 13,909 extracted teeth from 2,723 patients. This was accomplished in the following manner:

A record was made on a card, "Why teeth are extracted," of (1) age, (2) sex, (3) tooth or teeth to be extracted, (4) number of reasons, or diagnosis.

A considerable number of these case records were collected by private practitioners, but most of them were recorded in the diagnosis division and the surgical clinic at the College of Dentistry of the University of Minnesota. I mention this in order to call attention to the fact that the findings are not the results of a one-man opinion. On the contrary, we have presented the opinions of general practitioners, specialists in orthodontia, crowns and bridgework and prosthetic dentistry, the oral surgeon, the pathologist and the physician. The findings should, therefore, be representative of what actually is going on in dentistry.

The reasons for extracting teeth may be divided into two groups: pathologic and corrective. Pathologic are (1) caries, (2) pulp involvements, (3) periodontoclasia, (4) impacted teeth, (5) cystic involvements, (6) accidents. Corrective are (1) orthodontic, (2) prosthetic, (3) removal of supernumerary teeth.

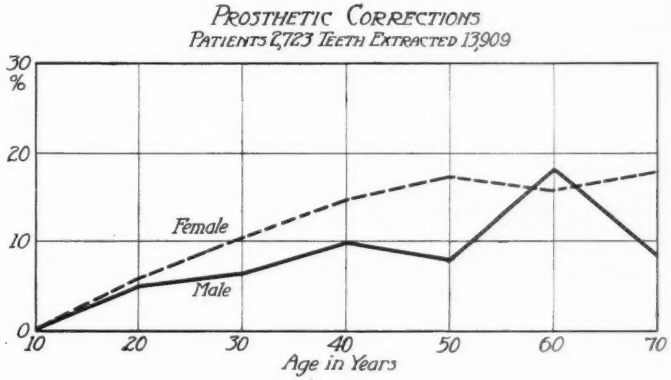


Fig. 6.

Caries.—In this division were recorded all roots and teeth so broken down by caries that any type of restoration was contraindicated.

Pulp Involvement.—Under pulp involvement were recorded (a) teeth that had been treated, and teeth with root

3. Brekhus, P. J.: Report on a Statistical Investigation of the Loss of Human Teeth, J. A. D. A., 15:679 (April) 1928.

4. J. A. D. A., to be published.

canal fillings, and with roentgenographic evidences of apical disease; (b) teeth with pulps exposed by caries and which it was found inadvisable to treat; (c) devitalized teeth with no roentgenographic evidence of disease, but under general suspicion; (d) pulps dead because of abrasion; (e) teeth injured by accidents; (f) pulps dead without known cause; (g) teeth with pulp stones and other pulp degeneration.

Periodontoclasia.—Under periodontoclasia were recorded all teeth extracted because of the loss of the investing tissues.

Impacted Teeth.—Here were recorded all imbedded teeth with symptoms or suspicion of disease.

Supernumerary Teeth.—All supernumerary teeth extracted for esthetic or orthodontic corrections are listed.

Age and Sex.—For the purpose of discovering whether there are any sex differences in respect to dental pathology, we studied each sex separately. The patients were also divided according to age in ten-year groups.

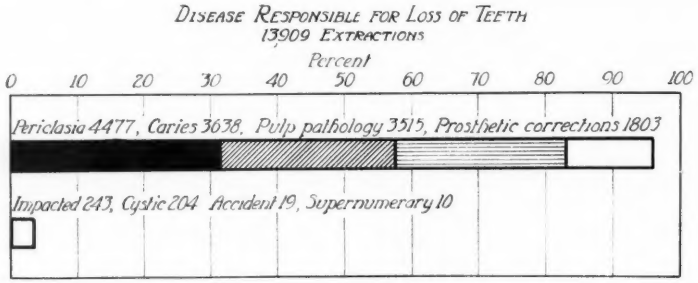

Disease Responsible for Loss of Teeth
13909 Extractions
Percent
0 10 20 30 40 50 60 70 80 90 100
Periclasia 4477, Caries 3638, Pulp pathology 3515, Prosthetic corrections 1803
Impacted 243, Cystic 204 Accident 19, Supernumerary 10

Fig. 7.

Cystic Conditions.—Under this heading were recorded all teeth with large apical areas and no fistulous openings.

Accidents.—Here were recorded all teeth lost from accidental injuries of the jaws.

In the corrective group, the following were recorded:

Orthodontic Corrections.—All teeth extracted for correction of malocclusion are here recorded.

Prosthetic Corrections.—Under this head were recorded all teeth out of function and of no value for restorative purposes.

BASIS FOR CALCULATION

Dividing the patients according to age in ten-year groups, we find 143 patients in the 10-20 year male group, with a total of 193 extracted teeth for all reasons. We take 193 as a basis for calculation in this group and call it 100 per cent. (See accompanying tabulation.)

		Per cent
Caries	99 or	51
Pulp disease	66 or	34.2
Periclasia	0	0.0
Orthodontic corrections	10 or	5.3
Impactions	10 or	5.3
Supernumerary teeth	1 or	0.5
Accidents	0	0.0
Cystic conditions	7 or	3.7

SEX DIFFERENCES

The difference of loss in male and female may be studied in the graphs

DENTAL DISEASE AND ITS RELATION TO THE LOSS OF HUMAN TEETH*

MALE PATIENTS, 1,202; TEETH EXTRACTED, 6,266; FEMALE PATIENTS, 1,521; TEETH EXTRACTED, 7,643

Age	No. of Patients	Total No. of Teeth Extracted	Sex	Caries		Pulp Disease		Periodontoclasia		Prosthetic Corrections		Impacted Teeth		Cystic Conditions		Supernumerary Teeth		Accidents	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
10-20	143	193	M	99	51.0	66	34.2	.....	.....	10	5.30	10	5.300	7	3.70	1	0.500	.....	.....
	198	461	F	236	51.2	159	34.4	1	0.22	27	5.85	16	3.460	16	3.46	3	0.650	3	0.660
20-30	224	698	M	235	33.8	308	44.5	58	8.30	46	6.60	31	4.450	16	2.30	.....	.....	4	0.059
	371	1,536	F	545	35.5	631	41.1	102	6.70	157	10.20	85	5.500	15	0.90	.....	.....	1	0.100
30-40	255	1,396	M	333	23.9	356	27.0	515	36.00	153	10.00	13	0.935	18	1.39	3	0.215	5	0.360
	430	2,526	F	804	31.8	740	29.3	525	20.80	377	14.92	44	1.720	34	1.35	1	0.040	1	0.040
40-50	247	1,455	M	316	22.5	296	20.5	685	46.50	120	8.20	19	1.290	16	0.80	.....	.....	3	0.210
	290	1,677	F	372	22.2	417	24.9	537	32.00	294	17.50	6	0.100	47	2.80	2	0.100	2	0.100
50-60	185	1,319	M	214	16.6	127	9.4	706	55.10	243	18.50	3	0.200	26	0.20	.....	.....	.....	.....
	148	899	F	160	17.5	178	20.0	404	45.00	143	16.00	11	1.200	3	0.30	.....	.....	.....	.....
60-70	118	959	M	168	18.0	116	12.0	587	61.00	80	8.20	3	0.300	5	0.50	.....	.....	.....	.....
	76	502	F	87	18.4	64	13.0	250	50.00	98	18.00	2	0.400	1	0.20	.....	.....	.....	.....
70-80	30	246	M	59	23.9	53	21.9	80	32.30	54	21.90	.....	.....	.....	.....	.....	.....	.....	.....
	8	42	F	10	24.0	4	9.5	27	64.20	1	2.30	.....	.....	.....	.....	.....	.....	.....	.....

(Figs. 1-6). In the incidence of caries, there is no difference up to the age of 20. Between the ages of 25 and 40, there is a constant increase in loss among women over men, but at the age of 50 the gap is closed. (Fig. 1.) In the incidence of periodontoclasia, we find a constant difference. Periodontoclasia set in about five years earlier in women than in men, but when we pass the 30-year line, the loss from periodontoclasia is from one-fourth to one-third greater in men than in women. (Fig. 3.) In the study of pulp involvement and prosthetic correction, the difference is so small and irregular that we feel it is of small importance. (Figs. 4-6.)

PULP INVOLVEMENT

Focal infection from diseased pulps and devitalized teeth is a subject of so much controversy in the profession that we felt it interesting and illuminating to go into more detail in checking the diagnosis of pulp involvement.

In the summary, we find 3,515 teeth, or 25.27 per cent of all teeth, extracted on account of pulp involvement. The greatest percentage of loss takes place between the ages of 20 and 35.

PULP INVOLVEMENT, DIVIDED INTO EIGHT CLASSES (FIG. 5)

The following divisions are made under "Pulp Involvement":

1. Teeth with root canal fillings and roentgenographic evidence of apical disease.
2. Teeth with pulps exposed by caries and treatment inadvisable.
3. Teeth with root-canal fillings and no roentgenographic evidence of apical disease, but extracted on suspicion.
4. Pulps dead owing to abrasion.
5. Teeth suspected of foci of infection with no roentgenographic evidence and no pulp treatment.
6. Pulps dead without known cause.
7. Pulps killed in accidents.
8. Pulp stones and other forms of pulp degeneration.

The sexes were studied separately. In the male group are 863 patients, with 2,163 extracted teeth. In the female group are 523 patients, with 1,332 extracted teeth. Basing the calculation on 2,163 for men and 1,332 for women, we find the percentage loss as follows:

1. Failures in treatment and root canal fillings: male group, 36 per cent; female, 41 per cent.
2. Pulps exposed and treatment not attempted: male, 32 per cent; female, 34.5 per cent.
3. Teeth with root canal fillings, no roentgenographic evidence of apical disease, but the patient suffering from some unknown foci of infection; teeth suspected and extracted: male, 13.5 per cent; female, 16.2 per cent.
4. Teeth with no caries and no pulp treatment but with vague symptoms of pulp disease: male, 3 per cent; female, 3.2 per cent.
5. Pulps dead because of abrasion: male, 8 per cent; female, 1.3 per cent. (We note the difference between male and female.)
6. Pulps dead without known cause: male, 6 per cent; female, 3.5 per cent. We find a number of cases in which the pulp dies without any evidence of external injury to the tooth. This is observed most frequently in the upper lateral and the lower central and lateral incisors.
7. Pulps dead through accidents: male, 1 per cent; female, 0.2 per cent.
8. Pulp stones and other pulp degenerations: male, 0.4 per cent; female, 0.1 per cent. Pulp stones are frequently observed in roentgenograms, but rarely give a history of disease. (Figs. 4-5.)

SUMMARY

By totaling the figures for men and women we find (Fig. 7):

	Per cent
Loss by caries	26.15
Loss by pulp disease and periodontoclasia	57.47
Prosthetic and orthodontic corrections	13.00
Impacted teeth, cystic conditions, supernumerary teeth and accidents	3.38

OBSERVATIONS

In reviewing our findings, we observe that:

1. Caries and periodontoclasia are the two diseases responsible (directly and indirectly) for 96.62 per cent of the extractions. The remaining 3.38 per cent are accounted for by impactions, cystic conditions, supernumerary teeth and accidents.

2. Periodontoclasia is more active in men than in women.

3. Caries is most active during the growing and developmental periods of life. Periodontoclasia sets in after maturity and increases with age.

4. From clinical observations, where caries is prevalent, there is little evidence of periodontoclasia, and in mouths with a great deal of periodontoclasia, there is little evidence of caries.

5. From our observations on pulp involvement, we find that the greatest percentage of loss is from teeth that have been treated and had the root filled. Lacking the clinical history of these cases, we have no right to draw conclusions as to the success or failure of root-canal therapy, but from clinical experience, we have reason to feel somewhat pessimistic. As an evidence of this fact, we have the large percentage of teeth with exposed pulp in which treatment was not attempted.

CONCLUSION

In view of the fact that the human race is losing more than 50 per cent of the teeth at the age of 40, and a large percentage of the teeth retained at that age are so diseased that they rapidly become lost; and in view of the fact that more than 96 per cent of these losses are accounted for by dental caries and periodontoclasia, preventable and curable diseases, according to our theory and practice, may we not justly question the effectiveness of modern dentistry?

Dean Alfred Owre said twelve years ago:

> The dentistry of the past, which we must *concede* to be *more* than half a failure, has undertaken to stand alone. It has considered itself a science of the purely physical order, concerned chiefly with the technique of filling holes. It has overlooked the fact that it is essentially of the animate order, with its source in biology, mother of the sciences, which deals with living organism.[5]

The situation is here summed up in a nutshell. Mechanics have failed. We must look to science.

In this age when science has solved so many mysteries and performed so many miracles making for human happiness, would it not be reasonable to imagine the possibility of science solving the problem of the cause and cure of dental disease? And if that is true, is it not our business to attack this problem?

5. Proc. Twenty-Fourth Annual Meeting American Institute of Dental Teachers, January, 1917.

A METHOD OF SECTIONING AND DIFFERENTIALLY STAINING THE HUMAN BRAIN*

By P. A. STEGALL, M.D., Atlanta, Ga.

THOSE of you who have cared to go into the history of the human brain, remember that Aristotle, 335 B. C., taught that the brain had nothing to do with thought, feeling or sensation—that it was a refrigerative plant to cool off the blood. Alcemon, who lived about 200 years before Aristotle, taught that the brain was the sole seat of the mind.

Galen, some 500 years later, or 160 A. D., settled for all time the fact that the seat of thought, feeling and sensation was in the brain.

After Galen, progress in this subject was slow for 2,000 years, as compared with advances made in subjects such as astronomy and chemistry. It seems that the most important organ in the human body, the container of the wealth of the world, was, and is, the last to hold fast its secrets.

At the Atlanta-Southern Dental College, about ten years ago, it was decided to try to find a way to study the anatomy of the human brain. One day, while I was in a meat market watching the butcher slice bacon with a rotary blade machine, I noted how thin the slices were and the idea struck me at once that this machine could be utilized to section the whole brain.

My next problem was to put the brain in a rigid condition. After several failures, I succeeded in infiltrating the whole human brain with parowax. This method has been published in the *Anatomical Record* and is accessible to any one.

The methods of sectioning the whole human brain heretofore in use have required a great length of time for celloidin infiltration, and more difficulty has been experienced in sectioning and tracing nerve pathways than is occasioned by the parowax method, which we have been using for the past eight years. It therefore seems desirable that this method be recorded for the convenience of others who are teaching anatomy of the brain.

By this method, it is very easy to get serial sections of the whole brain without discouraging difficulty or waste of time. The sections of the whole human brain give a little more than 1,000 specimens, which may be used for individual work in class demonstration or in tracing nerve pathways. Often every tenth section is sufficient for preservation and study. The whole process, from necropsy to completion of the sections, requires only thirty-four days.

The method that we have been using is as follows: A well-preserved brain is thoroughly dehydrated. A brain that has been kept in formalin (40 per cent solution of formaldehyd U.S.P.) solution should first be put in 60 per cent alcohol for four days, in 80 per cent alcohol for four days, in 95 per cent alcohol for four days and, finally, in absolute alcohol for seven days.

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The brain is allowed to drain for a short period (approximately two hours), the alcohol being allowed to drain out of the ventricles. It is then immersed in parowax and allowed to remain for six days. It will take about 8 pounds of parowax, which should be kept at a temperature not under 50 nor over 65 C. With a Bunsen burner, the outer walls of the container are warmed, and the whole mass is allowed to come out. It is then shaped into a block about 6 by 8 by 8 inches. This block of parowax containing the brain is then attached to a block of wood 2 by 8 by 8 inches.

The equipment necessary for the work is a rotary type of slicing machine. It is necessary to make some minor changes in it. First, we must have a good mechanic make a much smaller feed screw, that is, a screw with closer threads. A small razor blade is attached on each side of the rotary blade to keep the parowax from adhering to it.

The block is put in the machine and clamped with the holder. The block of parowax is warmed with the Bunsen burner, the machine is started and cutting is continued until the sections become brittle. The whole mass must be warmed to get the best results, especially in winter.

As sections are cut, they should be mounted on slides 5 by 7 inches. This is best done by having a container about 24 by 30 inches, 2 inches deep, containing water, which should be warm. Place the section in the water and gently push the slide under it, with one side tilted up, pressing the section down at one corner. Then lift it out of the water. The excess parowax is gently pulled away from the outer edge of the brain, only that part of parowax which has infiltrated the brain being allowed to remain.

The slide is then put on a table and a soft cotton cloth is spread over it and gently pressed until the excess water is absorbed. The cloth is removed and the slides are numbered. This is best done with a blue china-marking pencil. The slides are put away and allowed to dry. The parowax which has infiltrated the brain will preserve them without any cover for years.

With this method, it is possible to section the whole brain in sections less than 50 μ.

Sections of brain prepared as described above show very well, without staining, the anatomic relations of the chief brain divisions, the basal ganglions, internal capsule, ventricles, choroid plexus, and many of the fiber tracts, such as the olfactory and optic. The details of the medulla stand out fairly clear, so that the relations, size, etc., may be studied by the student.

The most difficult problem is the staining method. Details of this method are in process of being published in the *Anatomical Record*.

The equipment necessary for differential staining is as follows:

3 containers, 10 inches in diameter by 4 inches deep.
½ pound methylene blue.
1 gallon cedarwood oil.
40 gm. mecurochrome.
1 pound of ammonia (strong).
1 pound of soap.
1 package of fenestra.
1 package paper tape.
1 squeegee roller (the kind that photographers use).
20 pieces of soft cotton cloth, 12 by 36 inches.

Place the methylene blue in one of the containers, add enough ammonia to make it of a consistency of soft putty or thick cream, add 3 quarts of cedarwood oil, place on a gas flame, and stir vigorously. Allow it to boil ten minutes. Take off the flame, and allow to cool for about

four hours, then strain through a cloth to another container. To make the red dye, simply add the 40 gm. of mercurochrome to 1 quart of water, and stir until the mercurochrome is dissolved.

Into the third container, to 1 quart of water, add the soap.

I have not been able to standardize the length of time a section should stay in the blue dye because the methylene blue will not remain dissolved or held in suspension in the cedarwood oil longer than a few days, perhaps on account of the evaporation of ammonia. The temperature of the solution and room plays a part.

Have a rack that holds four slides and immerse the rack in the blue dye, allowing it to stay about five minutes. Take out, and remove the top slide, putting the remaining three slides back in the solution. Remove a slide every five minutes until you find the length of time that it will require to take the desired amount of blue, which takes the white matter. At the same time, remove the parawax which was infiltrated into the brain substance. As soon as you have removed the slide from the container, allow the slide to drain for a short period, then place on the edge a soft cotton cloth. Bring the other edge over the slide, and gently pass your hand over it as you do a blotter. This takes up the excess oil. Then immerse it in the strong soap solution for about one-half minute, take out and wash in fresh water, then immerse in the red dye until you have the desired red, which is the gray matter.

The section then is allowed to dry. It is necessary that the slide be watched; for if it is allowed to dry too much, it will begin to crack when it has dried out sufficiently to be smooth again. It must be mounted just before this point is reached. When it is dried sufficiently, put a teaspoonful of cedarwood oil on the end of the slide farthest from you. Then take a sheet of fenestra and allow one edge of it to come in contact with the oil, and then pull the oil over the section. When the oil has covered it completely, put on the sheet of fenestra, then with a razor blade trim the edges of the fenestra to the size of the slide. With the squeegee roller, push back and forth until you have it smooth, wipe the oil from the slide and put the tape around the outer edges.

If you care to have a name or number on the slide, put it on before you put the cover on. My experience in this method of differential staining leads me to believe that any dye soluble in oil will take the white matter. The water soluble will take the gray matter.

You may ask what I claim for this method of sectioning the brain. It is not only an ideal way for the student to learn the gross anatomy of the brain in the short time that he has in the anatomy laboratory, but it also shows pathologic conditions of the brain, thus giving the student a correct picture of the disease process. What I am really seeking is the cooperation of those interested in being of service to mankind in helping me to get the brains of persons who have become insane after adolescence.

There are two factors to be considered in the study of the brain. The brain is only the instrument through which we do our thinking: the mind, the soul, the personality, or whatever you care to call it, must work through the brain, to express thought.

If a person has lived a normal life and later has become insane, something has gone wrong in the brain, some pathologic process has prevented the brain from functioning properly.

If you will give me the brains of 100 insane people, with a complete history of their cases, I will give to the scientific world ten years more of my life, and I believe that in that time I can show the pathologic process causing at least some of these conditions.

If those of you have in mind some deceased person whose brain is accessible will obtain the brain for me, I will section it and give you without compensation as many of the mounted slides as you want. All I ask is a complete history of the case. I am endeavoring to examine only that which is capable of being examined, and it is therefore necessary that the brain be delivered to me in good condition.

I have had access to only one brain of an intelligent man, which is the one shown here.

ORAL DIAGNOSIS AS A FIRST APPROACH TO PREVENTIVE DENTISTRY*

By FRANK CUSHMAN, D.D.S., Boston, Mass.

WE have for many years discussed as the ideal of dentistry the prevention of disease in the mouth. Much time has been spent in bodies such as this in the attempt to define an elusive entity — something new in dentistry — that could properly be labeled and taught as preventive dentistry. The bacteriologist has insisted that control of bacterial activity in the mouth was preventive dentistry; the biologic chemist, that adequate nutrition of the tissues constituted the only true prevention; the clinician, that early sealing of structural defects and proper hygienic care were the core of the problem; and so on almost *ad infinitum*.

The multiplicity of theories of disease, arrived at by different approaches to the same problems, should cause us to pause and consider whether any one can be the panacea for which we are looking, or, indeed, if there is such a separate entirety of measures constituting preventive dentistry. Are we not forgetting the close interrelationships of the various forces at work in nature; how they act and react one on another, and how their sum total determines the state of wellbeing of any mouth at a given time?

Webster defines "prevent" as "to anticipate," to " forestall," "to check," "to keep from happening," "to avert." Does not every phase of our work, when properly carried out, have in it the seed of prevention? Cleanliness in the mouth has been demonstrated to be a deterrent of caries, presupposing, as it does, a lessened bacterial and chemical activity therein. Integrity of the tooth enamel through adequate calcification, and proper coordination of teeth in respect to contacts, marginal ridges and spillways, aided by saliva of normal consistency car-

*The papers of Drs. Cushman, Bryan and Rowe were presented as a symposium.

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ried to all parts of the mouth by properly balanced muscular movements, surely aid in maintaining cleanliness. The same factors of fine coordination tend to freedom from direct periodontal irritation, while occlusal trauma is predicated on malcoordination of opposing teeth.

We will all admit, I am sure, the importance of the establishment of these coordinations during the developmental period, the importance of adequate nutrition in their establishment and the necessity for careful supervision of all factors tending to interfere with nature's normal development, but it should be equally obvious that nature is so handicapped by our modern manner of living, and the dentist so hampered by deficiencies in knowledge and skill, that inharmonies in adult mouths will exist in many instances. Artificial means for their correction, and supporting treatment to minimize their effects, can surely be classified as preventive in their nature.

There are today many voids in our knowledge of ways and means by which we can aid nature in establishing and maintaining those conditions most conducive to an automatic state of health, and research is surely needed in determining the connection between the causes and effects that observation has led us to believe do exist. Is it not time that we learn to recognize that preventive dentistry is not a system of procedure unique and apart from our routine, but an integral part of it?

If this is true, how can it be taught effectively in any other way than as an integral part of clinical practice? Surely no student can be expected to believe that: (1) contact points are of importance in health maintenance when he sees them neglected in the placing of fillings in the infirmary; (2) adequate distribution of load is essential to health in the mouth, when he sees teeth overburdened with the attachments of prosthetic appliances, or put into traumatic relationship by the orthodontist under the name of esthetics; (3) the mutual support of the teeth is of moment in stabilizing their positions, when he sees extractions planned without consideration of the ultimate effect in unbalancing the occlusion; (4) a healthy circulation is a preventive of periodontal disturbance, when he sees the periodontist more largely interested in the planing of root surfaces than in stimulating the interest of the patient in massage; (5) dentistry is more than a repair procedure, when he sees the great emphasis put on the condensation of amalgam or gold, and the slight attention paid to a study of the possible reasons for the patient's susceptibility to caries, or (6) orthodontia is more than mechanics, when tooth rearrangement is given more consideration than the factors bringing about the deformity? Have we, in short, adequately equipped our students for health service merely by telling them of what appears to be true, and then encouraging the practice of only the mechanical phases of treatment in the infirmary?

Virtually all of our present hypotheses of disease in the mouth were evolved by careful observers many years ago, but have failed of adequate clinical application because the attention of a majority of the *clinicians* was focused on the local mechanical treatment of already established pathologic processes. If we are to make adequate application of what we already know and of such new hypotheses as research demonstrates to be workable, our students must be taught to observe accurately and minutely all influences in the mouth and body, both destructive and constructive, and they must be stimulated to intelligent interpretation of their observations in terms of causes and effects,

physiologic as well as pathologic. If preventive dentistry is to be more than a theory, measures of prevention must be applied on patients by the rank and file in general practice. Nowhere is there better opportunity for the creation of a point of view making this likely than on the clinic floors of our school infirmaries.

For a full appreciation of the possibilities of preventive measures in the mouth, the student must be taught early in his course that dentistry can be more than a repair procedure. An ideal of the normal structure, arrangement and operation of the mouth must first become a part of his very being. He must know what physical and environmental factors are of importance in the development of this ideal. He must consider what deviations from this normal constitute potential stage settings for pathologic conditions, and from what exciting conditions this may eventuate. Then, he must be shown by experience in the clinic the truth of his theories, in order that his treatment shall be planned to exercise to the limit control over potential, as well as actual, disease. How can such a program be consummated without the time and thought necessary for an adequate understanding of the conditions to be met in each case?

I would stress the importance of a broad point of view in the teaching of diagnosis. If our added intelligence is to be of value to the patient in the avoidance of disease, the term "diagnosis" must mean more than the distinguishing of a disease. I like to define it as "the determination of the nature of a condition." The study of deviation from our mental picture of the normal must include a search for its causes, both exciting and predisposing. Its symptoms must be correlated in the student's mind with the tissue changes taking place, and its history, extent, and possible sequelae outlined, the possible influence of other abnormalities in the mouth and of age, sex, health and mode of life on the future behavior of the condition, and its possible effect on the future health of mouth and body estimated, before any decision can be reached as to the necessity for interference. With this detailed information regarding all the forces at work in the mouth, tending to build it up and tear it down, a wiser decision can certainly be made as to what constitutes the major problem or problems in returning the mouth to, or keeping it in, a state of permanent health, and on allocating to the dentist, the physician and the patient their respective parts in the undertaking.

By such a procedure, the collection and interpretation of orderly, systematic, minute data, the attention of the student is focused on the relationships between cause and effect; for he learns to spread before himself the chain of events leading to the present condition and is able to look into the future and picture to himself the progressive loss of masticating efficiency and oral health liable to follow a condition left untreated. He learns that deviations from the normal are early signs of a potential pathologic condition, and he sees ways in which, many times with slight interference on his part, the normal can be reestablished and disease be averted. He recognizes the oral signs of systemic disturbance and appreciates the importance of systemic treatment in their control. His technical repair procedures are planned, not only as measures for arresting present pathologic conditions, but also as a means for restoring the function that spells continued health. And lastly, when lack of knowledge or skill precludes the establishment of the ideal, he learns the necessity for promoting other constructive influences as a means of minimizing the

effects of the expected chain of impending pathologic events. In short, he learns to *think* as well as to *do*.

Many intelligent and farsighted practitioners are already doing this, and their presence as teachers in the infirmary is of great value; but they must be reminded that conclusions at which they subconsciously arrive because of their experience must be arrived at by the student through a process of conscious thought. An orderly, systematic, uniform procedure in infirmary diagnosis, based on a knowledge of the normal and the factors causing deviations therefrom, cannot fail to give the student a broader conception of his problems in health maintenance, in increasing the fund of experience from which he may draw and in furnishing the patient with a more comprehensive health service. The added increment of clinical knowledge made available by intelligent, as well as skilful, dentistry will certainly result as well in increased stimulation to research.

CONCLUSIONS

1. Any and all measures directed at the avoidance of disease in the mouth should be the concern of the dentist.

2. If such measures are to be effectively applied, the dentist must learn to evaluate habitually all significant factors in mouth and body in terms of positive health.

3. Oral diagnosis, properly taught, is an effective means for furthering such a program. It can truly be said to constitute a major effort in preventive dentistry.

RESEARCH PROBLEMS IN PREVENTIVE DENTISTRY AND THE RELATION OF THE DENTAL SCHOOLS TO THEM*

By A. W. BRYAN, D.D.S., Iowa City, Iowa

IN a consideration of research problems in preventive dentistry and the relation of the dental schools to them, it is necessary first to determine the meaning of "preventive dentistry," for the title is limited to that phase of our professional field. I assume that the committee which had to do with the assignment of subjects wished to separate this discussion from research which has to do with the mechanical phases of dentistry. This separation in no way minimizes the importance of research along lines of improvement in dental materials and appliances, but such research is not so definitely linked up with the health of the patients to whom we are responsible.

Preventive dentistry refers to any procedure in dental practice which has to do with preventing or avoiding the occurrence of pathologic conditions. We cannot limit the term "pathologic conditions" to strictly oral tissues. More and more is the scope and responsibility of the dentist extending, and his place in the field

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of health service is constantly becoming more important. Whereas he formerly was able to determine his worth and value to humanity purely on the basis of his mechanical ability, he now must look farther ahead and assume responsibility for the systemic well-being of his patients as related to what he has undertaken in a mechanical way. No longer can he examine the oral cavity and make his diagnosis on the basis of mechanics alone: he must solve the problem from the standpoint of biologic findings, and consider the whole body rather than the oral cavity.

What are some of the problems in the field of prevention? If this question was put to a large group, it is probable that the majority would say "the prevention of caries." It is an undisputed fact that were we able to prevent caries, many of our other problems in dentistry would be solved. The problem of caries prevention has had its research workers for years. It is now being approached from two main angles. One group is working from the standpoint of local changes and reactions about the tooth surfaces. From their researches, much interesting and valuable evidence has been brought out and definite proof has been given that measures to control *Bacillus acidophilus* overgrowth are effective in preventing the development of new carious areas in mouths which have previously been susceptible. These measures are largely dietary in that the free sugar content is restricted to the extent that favorable mediums for growth are not presented to the bacteria.

On the other hand, another group is approaching the problem from the angle of the effect of diet on the integrity and resistance of tooth structure, assuming that tooth structure which has the proper mineral content will resist the attack of those agents causing caries. As a rule, the diets used by this group contain no free sugar; therefore, the supporters of the opposite theory maintain that the reason for the control is that there are no favorable mediums for bacterial growth in the mouth, thereby appropriating the results of this research as proof of their own theory.

Intimately linked with the final solution of this problem of caries is another question, one that many believe must be solved before great advance can be made. That problem has to do with the permeability of the hard structures of the teeth and the ability of these structures to carry nutritive material. If diet plays any part in the integrity of the enamel and dentin after they are once formed, diet must certainly be an important factor in the control of caries—not from the standpoint of local action in the mouth, but as related to the change in structure of the teeth from forces working from within outward. One group of workers claims that deep caries in the dentin may be arrested and that the dentin becomes hard and shiny after proper dietary measures have been instituted. If this is true, and a change in mineral content of the tooth structure has occurred, has the change been due to minerals laid down from within or has the corrected diet changed the general metabolism to the extent that the saliva is normal and minerals are carried into the dentin from it? In other words, is there, under normal conditions, a constant stream from pulp to saliva, or saliva to pulp, or both? Until much research work has been done along these lines, we must admit that both groups of workers have presented evidence that has weight.

Another important problem is that of diseases of the soft tissues of the mouth, marginal and peridental infections, and their effects on systemic conditions. What

part do surface infection and open pocket infection have on the health of the organs and tissues of the body remote from the oral cavity? The problem of focal infection has occupied the attention of the dental profession for years, has even split the profession into groups, and we cannot yet say that the question is solved. The effects of oral infection on the protective forces of the body, the changes that bacteria and their toxins produce in the chemical content of the blood, their effects on the nervous system—on all these problems there is still much work to be done. The question of systemic involvement from locked infection, the pulpless tooth problem, should have further investigation to emphasize the direct relationship existing in these cases.

Many dentists are still treating and retaining pulpless deciduous teeth with the feeling that, because of a supposedly high resistance of the young tissues to streptococcal infection, no systemic harm can come from them. But what about the thousands of serious heart involvements occurring in children up to 12 years of age? All of them cannot be laid at the door of infected tonsils. Let us find out more about it.

From the point of view of the orthodontist, there are several problems of great importance. I am told by those who are intimately associated with the work that one of the gravest problems in the field is delayed calcification of teeth and, as a result, their failure to erupt when they should and to their proper limits. It seems that there must be a field for research along this line to determine whether this is due to endocrine dysfunction or to incorrect diet which influences the processes of calcification and decalcification. It is perfectly plausible that the endocrine derangement, if it exists, is dependent on the dietary imbalance. This problem should not be neglected in our research program.

The second phase of our subject deals with the relation of the dental schools to these problems. It would seem that this relation is obvious. The dental schools have a definite responsibility in the work. No group or association has the opportunities for carrying on these investigations that the schools have. In the dental clinics, there is abundant material for research work, something that private practice does not afford. Conclusions drawn from research must be based upon numerous cases, and in the clinics of the various schools this material is to be found. Clinical patients will submit to tests that many private patients would object to. The foregoing statements are not designed to discourage research by other groups or by individuals. Much valuable material can be obtained, in fact has already been contributed from these sources, and should be used to substantiate or disprove the evidence brought out by the schools.

Another phase of the responsibility of the schools in this problem is the fact that they are training the men who are to go out to be responsible to the public. The schools should not be satisfied to give to their students anything but the most firmly established and latest truths. That means that they must be constantly searching for new things, working hand in hand with the medical schools on the problems of prevention. This does not release the private practitioner from his responsibility in the matter. All dental societies can do much to contribute to a solution of these problems, and every man should use his influence in his society work to see to it that the dental associations lend their assistance, both moral and financial, to carrying forward the work of research. The training that students

receive from the school has much to do with their attitude toward these matters after they enter practice. Therefore, the responsibility of dental schools is two-fold, lying, first, in the actual work that they must do in research, and secondly, in the attitude of mind that they transmit to their students.

THE NECESSITY FOR A BIOLOGIC CONSIDERATION IN PROSTHETIC DIAGNOSIS AS A FACTOR IN PREVENTIVE DENTISTRY*

By ARTHUR T. ROWE, D.D.S., New York City

THE term "diagnosis" is defined as the scientific determination of the distinctive nature of disease by its symptoms. In prosthetic cases, it has been the practice to consider the condition presented and the possible ways of restoring the masticatory mechanism to normal function as a unit, so that it is difficult to dissociate the two. For the purpose of this paper, I am using the term "diagnosis" to cover both.

No one will gainsay that the dental profession for many years attracted men to its ranks who were primarily of a mechanical mind. For a long period, advancement was made entirely along mechanical lines. A man can think only in terms of his own knowledge, and, with but few exceptions, dental knowledge was a knowledge of mechanics. When a case was constructed, and failed to give service, the failure was ascribed to faulty mechanics. Many ingenious methods for attachment of supplies to remaining teeth were devised. When one succeeded, it was immediately hailed as a solution of all previous trouble. Any man who has been in practice for some time can recall cases of bridgework or partial dentures that violated all the fundamental principles of good mechanical construction; yet the teeth and the surrounding tissues were healthy and the patient had long service from the appliance. On the other hand, he will have seen many cases that were works of art from a mechanical standpoint, yet the supporting teeth were loose, the surrounding tissue inflamed and unhealthy. Generally, the onus was placed on the "patient's resistance," a phrase that has been to dentistry what "ductless glands" has been to medicine.

The more analytically minded men in the profession began to see a deeper significance in these various successes and failures. It became apparent that there were underlying principles other than mechanics, and a biologic conception of the problem was gradually reached. The "patient's resistance" gradually resolved itself into "How well have the biologic requirements been met?"

The various laws of bone growth and change were applied to dentistry. The teeth were fulcrums receiving the stress, and through them it was carried to the bone, which was the buttress structure.

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This force could be made pathologic or physiologic, this depending on how it was directed. As the power was applied to the teeth by muscles, it was necessary to know the direction of the various muscle pulls and the direction of pull of the various resultant forces, if reconstruction were to be of a type to cause constructive changes in the jaws and features or only to maintain the presenting condition.

The age of the patient became an important factor—not the age in years so much as the measure of progress toward senility. Adaptability to change is limited by the state of body metabolism; that is, when one is in an anabolic stage, the chances for constructive change are much better than at an age where destruction is greater than repair. To make such a determination, a medical history is essential, as an index of biologic limitation.

Let us take a concrete case as an illustration: The patient has a lower right first molar and upper left second bicuspid missing. Offhand treatment would suggest two bridges to supply the missing teeth. More careful examination shows excessive overbite, heavy deposits of salivary calculus on the lower anterior teeth, and loss of contact between lateral incisors and cuspids, with beginning interproximal bone destruction. The upper left first bicuspid has drifted distally, opening contact with the cuspid. The lower right second molar has drifted mesially and tipped so that contact with the third molar is opening up. Food is being forced to the gingiva and beginning caries is present at the distogingival margin. The bite is closed somewhat and the upper posterior teeth are receiving a mesial thrust in mastication. The medical history is negative, except for recurrent sinus congestion. The patient's age is 28. A roentgen-ray examination reveals no pulpless teeth, but evidences of decrease in density of the crests of the interproximal bone.

An analysis of the findings would indicate that the loss of the two teeth had resulted in sufficient shifting and tipping of the remaining posterior teeth to cause a loss of horizontal dimension and increase in the overbite. The increase in overbite has thrown an abnormal load on the anterior teeth, causing the lower cuspids to occlude so heavily with the distoincisal angle of the lateral incisors as to produce a torsional stress, which, combined with the direct stress, has introduced the element of sheering, and the bony support is breaking down and contacts are opening. The closure of the bite has also made it an effort for the patient to swallow as he must close to occlusion to do so; consequently, the frequency of recurring deglutition has been reduced and the mouth drainage has been interfered with. The retention of the saliva in the floor of the mouth over a longer period gives more chance for precipitation and the heavy deposits are the result. In swallowing, the tongue comes into contact with the roof of the mouth and produces a negative pressure that automatically assists in the drainage of the sinuses. Less frequent swallowing results in congestion.

Closure of the bite results in the mandible traveling farther to make contact with mandibular and maxillary teeth so that, at the point of impact, the directional muscle pull is changed and a lateral or torsional stress is produced rather than a direct stress through the long axis of the tooth. Bone is lost opposite the point of contact and gingival irritation is produced.

Our case has become slightly more complicated. Evidently, if the progressive destruction is to be stopped, something more is needed than just filling the spaces

with missing teeth. The case must be surveyed, and the amount of opening necessary to restore the lost dimension be determined. Those teeth which are out of alinement must be cut off or built up so that occlusal balance and muscular balance are restored and normal function not only of the teeth but also of the muscles is restored. The increased tension on the muscles of the lip will probably result in the lateral incisors moving back to contact. Normal deglutition will give proper mouth and sinus drainage. Restoration of form will take care of the open contacts and the food will be carried off the teeth through the normal escape grooves over the free margin of the gingival tissue, stimulation of the tissue resulting, instead of irritation from food impactions.

When cases are considered in this manner from a biologic standpoint, such restorations as are made will be of a constructive kind. Nature will assist in bringing the oral cavity to a state of health. A healthy tissue presents the maximum of resistance and is less susceptible to invasion. If no further consideration is given the case than just the restoration of lost teeth, no correction of the causes of the degenerative processes that have taken place will have been made. The general health of the oral tissue will not be improved and will get progressively worse. Reduction in resistance of the tissue provides easier ingress for infective organisms, and the general health will suffer. The patient is given a false sense of security under the impression that he taking good care of his mouth. When he goes from bad to worse and finally become edentulous, his plaint is familiar: "I don't see why my teeth have all gone to pieces, for I have had regular dental care all my life." The answer would seem to be obvious,—"Restorative dentistry is preventive dentistry only as far as it meets the biologic requirement."

A NEW STATUS FOR ORTHODONTIA*

By ROBERT H. W. STRANG, M.D., D.D.S., Bridgeport, Conn.

ON June 29, 1928, at New London, Conn., Edward H. Angle read a paper before the society that bears his name entitled, "The Next Great Step in Orthodontia." In this, he once more brought to the attention of his audience, as he had done on many previous occasions, the logic of the entity of the specialty of orthodontia. On this particular occasion, he emphasized most forcefully the need for special educational facilities and he also advocated the enactment of laws by the legislatures of the various states making it necessary for the prospective practitioner of orthodontia to undergo examinations in theory and practice under the supervision of a legally appointed orthodontic examining board.

To most of us who listened to this discourse, it seemed but the dream of an idealist, the realization of which was destined to be far away in distant years and probably long after our period of

*A report of the new Arizona law "recognizing the practice of orthodontia as a profession separate and distinct."

active practice had ceased. But we were all greatly mistaken. Out in the western state of Arizona, in the city of Phoenix, there lives an orthodontist by the name of Charles H. Tweed, Jr. He quite recently took up the study of this specialty and obtained part of his training from Dr. Angle. In the intimate association coincident to this period of instruction, Dr. Angle discussed with him, time and time again, this vision of the individuality of orthodontia and the need for new legislation controlling its practice. The younger man became fired with a zeal to bring such a condition to a reality in his own state. To this end, he wisely and farsightedly approached one of the prominent senators of Arizona, the Hon. Allen K. Perry, a man of unusual integrity, with a keen vision of progress, who listened with open mind, became exceedingly interested, aided the doctor in drawing up the proper bill and introduced it in the senate. He followed on its trail until it had passed through both houses and was signed by Gov. John C. Phillips, Feb. 19, 1929. And so seven months after that meeting in Connecticut, a dynamic orthodontist out in the West had carried through the suggested legislation in his state. Charles H. Tweed and his co-workers, the dentists of Arizona, Senator Perry, Representatives Partridge and Finch, and J. Howard Furby, orthodontist, of Pasadena, Calif., who spent many days with Dr. Tweed campaigning throughout the state and in council with committees of the house and senate, have made history this year. Both dentistry and orthodontia owe a debt of gratitude to these individuals.

Such an enactment was not obtained without a struggle or the expenditure of a vast amount of time and energy. The following paragraphs, quoted from a recent letter of Dr. Tweed's, is of interest and somewhat enlightening. He writes:

Yes, I have worked hard for the past four months on this bill. In fact, I have traveled some 4,000 miles visiting practically every dentist in the state, explaining the contents of the bill, getting their support in writing, requesting that they write or personally see their legislators asking them to support this bill and then selecting one man in each of the larger towns to keep me informed at all times. The parents of my little patients and also my little patients all helped by writing letters to their legislators and urging their friends to do likewise. I received the aid of all the prominent citizens and particularly superintendents of various schools and public officials throughout the state that I could come in contact with.

When the legislature began its session, Senator Perry, a prominent lawyer in Phoenix, and I, drew up the bill. J. Howard Furby, of Pasadena, came over and gave us two weeks of his time and did much in aiding us to get the bill through the senate. Ignorance as to the meaning of orthodontia was prevalent throughout the entire legislature. We had pictures of extreme cases before and after treatment, and, by means of personal chats, were able to impress on each and every member of the senate and the house, the merits and necessity of this great measure for the protection of little children and the elevation of our specialty to the position that it deserves. At one stage of the fight, Dr. Furby and I were compelled to make a trip of 240 miles between 4 o'clock in the morning and 2 in the afternoon. We got a retraction of a damaging letter back to the senate in time to nullify the effects of the letter that would have defeated our bill.

I have been told that to pass any bill successfully in any legislature one must first have a bill of merit, and then by hard work follow it incessantly until it is passed. On two occasions, our bill would have been defeated had Furby and I delayed for half a day.

Senator Allan K. Perry gave me much of his valuable time, and it was his advice that I followed closely and that made the passage of this bill possible. He kept me posted constantly while the bill was in the senate and then followed this bill into the house and after that right up to the governor. He did not stop until the governor signed the bill, and

as soon as this was done, it was Allan K. Perry that phoned me the glad tidings.

What is the natural sequence to this legislative act taken in behalf of our specialty? First, it means that there will be just and legal protection for innocent children who can no longer become the victims of superficially prepared operators in orthodontia. A field that is extremely interesting and pleasant to practice in and one that offers financial returns above the average of general practice is very enticing and consequently is apt to draw unto itself an unusually large proportion of poorly trained workers. Parents are not in a position to judge of the skill of the man in whose charge they place their children and the ethics of professional associates forces them into silence; hence, a legal safeguard is very necessary and timely.

Secondly, in order that the demand for thorough preparation may be supplied, it means the establishment of a real college of orthodontia, something that our specialty has needed for years and has been unable to evolve because custom had dictated that such training should be a part of the curriculum of the dental college, and here, unfortunately, the teaching of orthodontia was necessarily somewhat of a side issue so that there has never come forth, in all these past years, a single well-trained orthodontist, as a product of a dental college. When the law says that a doctor, before he can obtain a license to practice orthodontia, must have had 3,400 hours of training in anatomy, histology, embryology, dental anatomy, comparative anatomy, physiology, dental pathology, rhinology, dental science, metallurgy, art, roentgenology, photography and orthodontia, and that the study of the latter subject shall occupy about 60 per cent of the total allotted time, facilities for such preparation will soon be forthcoming. This unquestionably means the solution of orthodontia's greatest need today, a scientific educational institution.

It means also taking out of the dental curriculum one of the weakest links in its whole educational program. To many deans, orthodontia teaching has been like a chronic ulcer, responding to no line of treatment because the specific remedy lay only in radical excision, and palliative methods were unsatisfactory—the sore remained a smoldering irritation. These men will welcome the radical change that will eventually come and will do all in their power to hasten its advent and further its welfare. It is to be hoped that this feeling of cooperation and good will is the sentiment of the majority of dental educators. Certainly, it is the only solution of orthodontic education.

Again, it means that orthodontia will be stimulated to advance in scientific knowledge and mechanical perfection with far greater speed than ever before in its history. The men entering the specialty will be prepared to study the many problems of biology and mechanics that peculiarly blend in this field and their combined deductions will result in the solution of important factors pertaining to growth, etiology, treatment and retention.

Lastly, it means that all other states, one by one, will fall into line and enact similar laws protecting the welfare of the children under their jurisdiction.

The act of the Arizona Legislature therefore marks an epoch in the history of orthodontia. It is a source of great rejoicing to those who have the future welfare of this special field at heart. Medicine, dentistry and law have all passed through similar stimulating and segregating steps and now our own profession is so blessed. May the spread of

such law enactments be rapid and complete!

A brief resumé of this law is herewith appended:

An Act to Amend Sections of the Law so as to Define Orthodontia; and to Recognize the Practice of Orthodontia as a Profession Separate and Distinct from Dentistry; Prescribing the Qualifications of Dentists and Orthodontists; and Providing for the Examination, Licensing, and Revocation of License of Dentists and Orthodontists.

Be It Enacted by the Legislature of the State of Arizona:

Section 1. . . . A person shall be deemed practicing orthodontia who for a fee or reward shall attempt to, or perform an operation upon, or give treatment that has for its object the correction of abnormal position and relation of the teeth, jaws and arches, and the restoration to normal structure and function of such related bones, muscles and other tissues as are abnormally affected thereby.

Any person who shall practice dentistry or orthodontia or in any manner advertise himself as being engaged in the practice of dentistry or orthodontia in this State, unless licensed as such, as in this article provided, shall be guilty of a misdemeanor.

. . . The Board of Dental Examiners and two practicing orthodontists, appointed by the Governor, shall constitute the examining board for orthodontists; which joint board shall have and exercise all powers of supervision and license of orthodontists as the Board of Dental Examiners have with respect to dentists. The officers of the Board of Dental Examiners shall constitute the officers of the examining board for orthodontists.

Section IV. . . . A person desiring to practice orthodontia in the State shall file a verified statement of his qualifications with, and make application to the board in form as by it prescribed, for an examination, and pay an examination fee of twenty-five dollars, which shall not be refunded if the applicant is eligible for examination. An applicant failing to qualify on his first examination shall be entitled to one additional examination by the board without additional fee. Such applicant shall furnish satisfactory proof of having been in residence at a college or university and having there completed courses in each of the following subjects: Chemistry, 10 units; Zoology, 8 units; Physics, 8 units; English, 12 units; and Mechanical Drawing, 2 units.

Such applicant shall present satisfactory proof of having graduated from a legally chartered school, college or university approved by the Board of Dental Examiners of Arizona, offering or maintaining a course of instruction in orthodontia covering the following minimum requirements:

Group I

Anatomy, Histology and Embryology, 10 to 15 per cent.

Group II

Dental Anatomy and Comparative Anatomy, 6 to 8 per cent.

Group III

Physiology, 3 to 4 per cent.

Group IV

Dental Pathology and Rhinology, 3 to 4 per cent.

Group V

Dental Science and Metallurgy, 3 to 4 per cent.

Group VI

Art, Roentgenology and Photography, 1 to 2 per cent.

Group VII

Orthodontia, 53 to 63 per cent.

Total number of hours required, 3,400.

Such applicant shall present proof that he or she has complied with and fulfilled the educational requirements herein provided for applicant to take examination as an orthodontist; provided, however, that orthodontists from any other State who do not have the foregoing educational qualifications but who have practiced orthodontia exclusively for a period of five years or more prior to the effectiveness of this act, will be allowed to take the examinations, and the passing, will be admitted to the practice of orthodontia.

. . . Examinations for orthodontia shall be theoretical and practical. The theoretical examination shall be in writing upon the following subjects:

Anatomy, Histology, Embryology, Comparative Anatomy, Physiology, Dental Pathology, Rhinology, Dental Science, Metallurgy, Art, Roentgenology, Photography and Ortho-

dontia. Total number of hours required—3,400 hours.

Written examination may be supplemented by an oral examination.

Demonstration of the applicant's skill in Orthodontia must also be given.

Nothing in this act contained shall prohibit bona fide students in orthodontia from operating in the clinical departments or laboratories of a reputable school of orthodontia, dental college or university recognized by the board of orthodontia examiners.

Any dentist, licensed by the State Board of Dental Examiners of Arizona, prior to the effectiveness of this Act, shall be eligible to practice orthodontia without complying with the foregoing provisions of this Act, relating to orthodontia, provided that such licensed dentist register with the state board of orthodontia examiners as a licensed orthodontist prior to July 1, 1934; or students resident in dental schools, at the time of the passage of this Bill may be eligible to the examination for orthodontists provided they have completed a one year postgraduate course in orthodontia in a school, college or university recognized by the state board of orthodontia. The Board shall issue an appropriate license to practice dentistry or orthodontia or both, to any applicant entitled hereunder.

This law also provides for the revocation of the license for proper cause.

886 Main Street.

THE RELATION OF DIET TO CARIES AND OTHER DENTAL DISORDERS*

By MILTON THEODORE HANKE, Chicago, Ill.
(In collaboration with The Chicago Dental Research Club)

ABOUT 40 years ago, W. D. Miller[1] suggested a theory of dental decay that has been rather generally accepted. Decay was assumed to occur in two stages. Acid, produced by the action of bacteria on starch or other carbohydrate, dissolves the calcium salts of the teeth. Other, or the same, bacteria produce proteolytic enzymes, which dissolve the organic matrix (collagen or elastin) and cause complete disintegration of a portion of the tooth structure. The first stage was considered to be the most important and, in the course of time, the fact that Miller had recognized a second stage has been almost forgotten.

The acid and bacterial theory of dental caries has led to the commercialization of a large number of alkaline tooth powders and pastes, to the slogan that a clean tooth cannot decay and to the widespread use of the toothbrush and antiseptic mouth washes.

In spite of the fact that a campaign of cleanliness, alkalinization and gum massage has been waged for many years, caries and other dental disorders have continued.

Miller's theory is far too simple to explain dental caries. (A careful consideration of Miller's book and his many publications shows that Miller, who was a careful observer, could not explain all of his findings on the basis of his theory.) This theory does not differentiate between a pulpless and a vital tooth, nor between an old and a young tooth. The

*From the Otho S. A. Sprague Memorial Institute and the Department of Pathology, University of Chicago.

1. Miller, W. D.: Microorganisms of the Human Mouth, Philadelphia: S. S. White Dental Mfg. Co., 1890.

tooth is considered to be an inert mixture of calcium salts and cementing material. The decay is a purely chemical process that begins with a solution of the lime salts by acid.

I am not convinced that acid is the most important factor in decay. The following facts are hard to correlate with the acid theory.

The saliva is usually just about neutral in reaction. It may be slightly acid or it may be slightly alkaline to litmus, but this is a matter of little consequence. The important fact is that saliva is a buffered liquid. It is capable of neutralizing a certain amount of acid without itself changing materially in reaction. A steady flow of saliva will rather effectively prevent an accumulation of a high concentration of acid anywhere in the mouth, and tricalcium phosphate, the chief constituent of the teeth, is not readily soluble in very dilute acid.

Any dentist is familiar with the fact that decay is not common in patients afflicted with pyorrhea. The actual number of bacteria in pyorrhea is, however, far greater than can be found in the average mouth in which active decay is going on. These bacteria, largely streptococci and spirochetes, are acid producers. Why, then, do not the teeth in pyorrhea patients decay more rapidly in the presence of this increased number of bacteria?

All of you are familiar with cases in which there is little decay in the enamel but an enormous decayed area in the dentin. In some way, the decay has spread to the more susceptible dentin through a tiny opening in the enamel. Enamel contains only from 2 to 3 per cent of organic matter. It is composed almost entirely of calcium salts. Dentin contains about 28 per cent of organic matter and a correspondingly smaller amount of calcium salts. Since decay is supposed to be due to the action of acids on calcium salts, and since enamel is composed largely of calcium salts, one would logically expect the enamel to be most susceptible. This is, of course, not the case. (Miller's experiments on artificial decay are of interest in this connection. Some tooth sections that had been immersed in a mixture of bread and bacteria for three months showed a profound caries of the dentin and no action at all on the enamel. The enamel had not even lost its polish. The selective action on the dentin is hard to explain if acid is considered to be the active agent, but easy to explain if the action is assumed to be due to proteolytic enzymes.)

You may object to this line of logic by saying that enamel will dissolve less readily than dentin because the enamel is denser. This is, of course, possible, but this will hardly account for the fact that, in some cases, both in the mouth and in artificial decay experiments, the enamel has not been attacked at all under conditions that have led to a profound disintegration of the dentin.

It is difficult, if not impossible, to obtain a tooth in which an exterior caries of the enamel has occurred in such a way that the carious material has remained intact. It is not so difficult to obtain teeth in which caries of the enamel has occurred on the dentin side. The enamel in these cases has acquired a soft, cheesy consistency as if the cementing material had been dissolved away, leaving the calcium salts in the form of a soft nonadherent powder. A microscopic examination of this cheesy material reveals the presence of disorganized enamel rods, either singly or in groups. It appears as if the cementing material that binds the rods together has been dissolved away.

The latter two illustrations indicate strongly that the bacteria, or their ex-

tracellular enzymes, attack the cementing material (the protein) rather than the calcium salts. This would place the emphasis on Miller's second stage of decay rather than on the acid.

If bacteria are involved in caries, and I think that they are, and if they act on the cementing material of the tooth rather than because of the acid that they produce, a radical change will have to occur in our prophylactic measures. An alkaline dentifrice has virtue only because it neutralizes acid and because of its mild abrasive properties. If the neutralization of acid should prove to be nonessential, the alkaline dentifrice has but little value, because such preparations, as they are used by the layman, do not effectively remove bacteria from the teeth.

A number of important facts cannot readily be explained by the acid theory of caries. All of you are familiar with cases in which the teeth remain clean without brushing. Such mouths contain the usual kinds of bacteria, but the bacteria do not seem to be able to obtain a foothold. Miller's theory does not, of course, explain why these mouths remain clean. You have seen cases in which the teeth become heavily coated with calcium deposits, bacteria and food detritus, but in which there is no tendency toward decay. Such cases are hard to explain on the basis of the acid theory. These deposits are excellent breeding grounds for bacteria and they are, undoubtedly, acid in reaction, but they are not, necessarily, conducive to decay. The opinion among dentists appears, in fact, to be that decay is not common in mouths in which these deposits form readily. The fact has long been recognized that dental caries is rare in certain communities and prevalent in others. The prevalence of caries during puberty and pregnancy is well recognized.

The underlying predisposing factor in dental caries appears to be metabolic, and I believe that improper diet is the commonest predisposing factor in all dental conditions.

The average American will tell you that he eats everything, that his diet is beyond reproach. Sometimes he does eat everything. The difficulty lies not so much in the kind of food that is eaten but rather in the quantities in which it is eaten. Most Americans are well nourished. They consume food sufficient to maintain a certain body weight and to enable them to work more or less efficiently. They usually obtain enough vitamins to remain in a fair state of health. They do not obtain a sufficiency of some of the vitamins to insure perfect health of all of the body tissues. The mouth is one of the first places where chronic small deficiencies are manifested. The dentist has, therefore, been confronted with these conditions for years, but he has not always recognized them. The dentist, and for that matter the clinician, is seldom confronted with a frank case of scurvy, and yet a mild form of scurvy is very common. Aside from changes that occur inside the teeth and in the periodontium, and Howe and others have done much to call these to our attention,[2] there are changes occurring in the gum tissue that any one can recog-

2. Howe, P. R.: Dent. Cosmos, 62: 586-590 (May); 921-929 (Aug.) 1920; 68:33-35 (Jan.) 1926; J. A. M. A., 79:1565-1567 (Nov. 4) 1922; J. Dent. Res., 3:7-37, No. 1, 1921. Toverud, Guttorm: J. Biol. Chem., 58:583-600, 1924. Zilva, S. S., and Wells, F. M.: Proc. Roy. Soc. London, 90:505-512, 1919. Wells, F. M.: Brit. J. Dent. Sc., 64:135-150 (May 2) 1921. Masaki, Tadashi: Studies in Vitamin Deficiency Diseases, J. A. D. A., 14:1654-1656 (Sept.) 1927. Grant, Agnes H.: Dent. Cosmos, 68:899-904 (Sept.) 1926. Höjer, H., and Westin, G.: Dent. Cosmos, 67:1-24 (Jan.) 1925.

nize. The gums may be merely mottled in appearance with no particular inflammation; they may be inflamed but not sufficiently so to bleed, or they may be swollen and inflamed, and bleed easily. These, and canker sores, may all be symptoms of scurvy. A pyorrhea case is usually primarily a case of scurvy. The infection and the pus are secondary to the gum condition and possibly to the bone condition. Since scurvy is known to be due to a lack of vitamin C, it would not be surprising to find that patients with inflamed gums are eating food that is deficient in this vitamin. This is indeed the case, as shall be shown later.

That vitamins should have something to do with swollen gums and pyorrhea is not hard to believe; but what possible relation can vitamins have to dental caries?

You are probably familiar with the fairly recent agitation concerning vitamin D. This vitamin is most certainly associated in some way with bone deposition. It is also associated with the calcium and phosphorus concentration in the blood serum. When an infant's diet is deficient in this vitamin, the child is apt to develop rickets. There is, I believe, no doubt as to the association of vitamin D with rickets. This vitamin, or a substance that has all of the pharmacologic action of this vitamin, is now obtainable in concentrated form, in solution in oil, under a number of trade names.

That this vitamin might, in some way, be associated with tooth formation and tooth degeneration seems entirely logical, and this idea has led to considerable research and some far reaching conclusions.[3] A careful consideration of this work has shown that much of it was not carefully controlled. Too little attention was paid to the vitamin C factor. In some cases, the published results can hardly be interpreted as improvement, and when improvement has apparently occurred, this cannot surely be interpreted as being due to vitamin D.[4] It would, obviously, be incorrect to credit cod liver oil with the sole responsibility for an improved dental condition if orange juice was fed along with the cod liver oil. I was not certain, from the evidence in the literature, that any connection existed between diet and caries. The work that I wish to describe briefly here has been carried out to clarify this matter.

I have been assisted in this work by the members of the Chicago Dental Research Club. They have come into it with the proper amount of skepticism. They have supplied the patients and the dental information. I have interviewed the patients, have questioned them rather fully on their general state of health with special reference to gastro-intestinal disturbances and to possible endocrine deficiencies, have made a thorough study of their previous diet, have examined the blood for calcium and phosphorus, and frequently for other constituents, and have then made the necessary recommendations. I might say here, in passing, that it is not difficult to obtain cooperation. The patients have come without protest and, in the majority of cases, have been quite willing to change their diet. As will be

3. For review with extensive bibliography, see Mellanby, May: Physiol. Rev., 8:545-577 (Oct.) 1928. Mellanby, May, and Pattison, C. L.: Brit. M. J., 2:1079-1082 (Dec. 15) 1928. Price, W. A.: Am. J. Dis. Child, 33: 78-95 (Jan.) 1927. McCollum, E. V., and others: Bull. Johns Hopkins Hosp., 33:202-215 (June) 1922. Marshall, J. A.: Dental Caries and Pulp Sequelae Resulting from Experimental Diets, J. A. D. A., 14:3-37 (Jan.) 1927. Weinmann, J.: Klin. Wchnschr., 8:841-842, 1929.

4. To be discussed in detail in a subsequent publication.

shown later, these dietary changes are not radical and are, in most cases, agreeable.

The sum total of the foregoing information has made it possible to draw fairly accurate conclusions as to the vitamin intake. The blood examination supplies valuable information as to the vitamin D intake if the age of the patient is taken into consideration. The blood of a child under 10 years of age normally contains from about 11.5 to 12.0 mg. of calcium and from 4.5 to 5.0 mg. of phosphorus per hundred cubic centimeters of serum. These figures gradually decrease until, at the age of 50, the calcium is from about 10.0 to 10.5 mg. and the phosphorus, about 3.0 to 3.3 mg.[5] There appears, at any age, to be a definite orientation of these figures under proper dietary conditions. An improper balancing of the ratio between calcium and phosphorus is an indication of improper vitamin balance. One of the remarkable results of this investigation has been the observation that a proper orientation of the calcium and phosphorus values occurs within thirty days, possibly sooner, after an adequate vitamin intake has been established.

The record on 114 cases has been completed to date. These cases have been charted by age and by dental condition and the results are summarized in the accompanying table.

THE RELATION OF DIETARY DEFICIENCIES TO CARIES AND TO OTHER DENTAL DISORDERS*

Age Range Years	No Dental Disorders — Group I Dietary Deficiency				Caries — Group II Dietary Deficiency				Caries and Gum Inflammation — Group III Dietary Deficiency				Gum Inflammation and Pyorrhea; No Caries — Group IV Dietary Deficiency			
	None	C and D	C	D	None	C and D	C	D	None	C and D	C	D	None	C and D	C	D
0-10	2	1				2	4			1						
11-20	4		2	1		9	16			2	4			1	2	
21-30	1			1		6	3			2	3			1	5	
31-40			1			3	3			3	3			3	3	
41-50	2						1			3	3			2	4	
51-up	2										1		1	3		
Totals	11	1	3	2	None	20	27	None	None	11	14	None	1	10	14	None

*In no case were any of the dental disorders associated with a pure D deficiency. Fifty-five cases, i. e., 50 per cent of them, were deficient only in C.

5. Greisheimer, Esther M.; Johnson, Olga H., and Ryan, Mary: Relationship Between Serum Calcium and Age, Am. J. M. Sc., 177: 704-710 (May) 1929. Kylin, Eskil: Calcium and Potassium Content of the Blood, Acta med. Scandanav., Supp. 19, p. 1-112, 1927.

For the sake of convenience, the dental disorders have been divided into four groups: 1. No dental disorders now. 2. Caries. 3. Caries and pyorrhea or gum inflammation. 4. No caries; other conditions as in Group 3.

You will note that seventeen of the 114 persons were free from dental disorders (Group 1), and of these, eleven were eating a diet that contained ample vitamins. The dietary deficiency in all of the other cases in this group were slight except in the case of one boy, aged 17, whose diet was markedly deficient in vitamin C but whose mouth was in good condition. This boy is not in good health.

The caries group (Group 2) comprises forty-seven cases. Of these persons, not one was eating a perfect diet and not one was eating a diet that was deficient only in vitamin D; but twenty-seven were eating diets that contained plenty of vitamin D but were deficient only in vitamin C. From this, it is clear that people may have carious teeth even though they are ingesting an adequate amount of vitamin D. Note also the fact that this entire group was eating a diet that was deficient in vitamin C.

Group 3 represents the patients that have sore gums and caries. There were twenty-five of these. None of them had a perfect diet and none of them were eating a diet that was deficient only in vitamin D. Every one of these patients was living on a diet deficient in vitamin C and fourteen of them ate a diet that was deficient only in vitamin C.

Group 4 is the true pyorrhea group. Of the twenty-five cases, fourteen had pyorrhea. The other eleven had sore gums, bone absorption or dead pulps. Caries was absent in all cases. In one case, a woman of 59 had inflamed gums. The diet was perfect. This proved to be a case of mechanical irritation due to malocclusion. The diets in the remainder of these cases were deficient in vitamin C, and fourteen of them showed no other deficiency. None of the diets were deficient only in Vitamin D.

REPORT OF CASES

CASE 1.—A girl, aged 15, had twenty-seven cavities at the time of first examination, Dec. 29, 1928. There was progressive decay. The gum tissue was poor. The diet was very deficient in vitamin C and somewhat deficient in vitamin D. The calcium content was 10.88; phosphorus, 4.49. The patient returned, March 23, 1929. Cooperation was fair. She drank the juice of two oranges and one lemon a day and usually ate half a grape fruit, and about 3 eggs a week. The calcium content was 12.42; phosphorus, 4.0. These values are normal. The gums were in healthy condition. There was no advance in dental caries.

CASE 2.—A girl, aged 15, examined, Jan. 2, 1929, showed progressive decay. The gum tissue was poor. The diet was very deficient in vitamins C and D. The calcium content was 10.75; phosphorus, 3.81. She returned March 13. Cooperation had been poor. The diet had not been changed, but she took 5 drops of "acterol" per day during this period. The calcium content was 12.50; phosphorus, 4.0. These values have become normal. The acterol had evidently removed the vitamin D deficiency. The dentist reports no improvement. Vitamin D alone did not retard the carious process.

CASE 3.—A girl, aged 12, examined, Feb. 2, 1929, showed marked hypertrophy of the gum tissue and not much decay. The diet was rather deficient in both vitamins C and D. The calcium content was 10.27; phosphorus, 3.92. She returned, May 4. Cooperation was excellent. The diet contained an abundance of vitamins. The general health was excellent, and there were no colds. The patient gained in weight and grew 1 inch taller. The calcium was 12.5; phosphorus, 4.40. The dentist reports the gum condition excellent, with no decay.

CASE 4.—A woman, aged 25, examined, Jan. 1, 1928, showed severe pyorrhea, with extensive bone destruction. The teeth had been condemned by a roentgenologist. The diet was very deficient in vitamin C but quite adequate as to vitamin D. The patient returned, April

4. Her cooperation was excellent, and she was now on a diet containing an abundance of vitamins. The calcium content was 11.76; phosphorus, 3.42. The dental report states that the mouth has gradually improved. The teeth are solid and the gums in excellent condition. There is no pus present.

CASE 5.—A woman, aged 38, examined, Dec. 10, 1928, showed considerable bone destruction. The teeth were loose, but there was no decay nor pus. The general health was poor. The diet was deficient in vitamin C but not in D. The calcium content was 11.65; phosphorus, 3.64. The patient returned, April 18. Her cooperation was excellent. Vitamin C was taken in abundance, but no change was made in the vitamin D intake. The menopause started during this fourth-month interval. The general health was excellent and the patient gained 19 pounds. The calcium content was 11.36; phosphorus, 2.66. The dental report showed that the gum tissue was of excellent quality and the teeth were much tighter. The mineral balance changed in spite of the vitamin D intake and coincidently with the menopause.

From this entirely unprejudiced survey we have been forced, rather contrary to our expectations, to the conclusion that if diet is a factor in dental disorders, vitamin C is probably the most important constituent. This conclusion has already been reached by Howe on the basis of his animal experiments, but it is rather contrary to the teachings of May Mellanby and others.[3] Some investigators would have us believe that irradiated ergosterol (affording vitamin D) is a panacea for dental caries. Our checkup indicates that the average American diet is not usually very deficient in vitamin D.

Vitamin C, a highly important accessory food factor, is a very unstable substance. It is destroyed rapidly by alkali and by heat, especially in the presence of oxygen. It is not stored in the animal body and, since the body tissues are slightly alkaline, and at a high oxidation reduction potential, one would hardly expect this vitamin to survive very long. Vitamin C is present in the largest amounts in those foods that are most strongly acid, e.g., lemons and oranges. Milk, which is an alkaline fluid, will, under favorable conditions, contain an abundance of vitamin C immediately after it leaves the animal body; and man was, of course, not supposed to consume milk out of a bottle. As purchased, milk contains very little vitamin C. All green plants probably contain some vitamin C, but the quantity is, in most cases, small. Of the leafy vegetables, raw lettuce and cabbage can be recommended as sources of this vitamin.

Since vitamin C is rapidly destroyed by the living animal tissues, it is essential that an abundance of this vitamin be eaten every day. Under ordinary circumstances, the daily requirement appears to be supplied by the juice of one-half lemon and half a pint of orange juice. This intake may have to be doubled in the case of excessively active, nervous individuals, especially if they are not obtaining the proper amount of sleep. The amount of vitamin required appears to be very much greater than we have heretofore suspected and it appears not to be the same for all people.

Scurvy, the disease produced by a lack of vitamin C, is primarily a capillary disease. The capillary endothelium swells and degenerates. The flow of blood through the involved capillaries is retarded or checked completely. The tissue that depends on this capillary blood supply for its nourishment is partially or completely asphyxiated. Howe has described clearly the changes that occur within the pulp under these conditions. It is not unlikely that a certain percentage of deaths of pulps can be traced directly to dietary deficiency. The periodontal membrane (periosteum alveolare) is similar to the periosteum surrounding any bone, and

scurvy has long been known to lead to an inflammation and degeneration of periosteum. Inflammation and bleeding of the gums are well recognized early symptoms of scurvy.

These dying tissues are excellent culture mediums for bacteria. The infections, the presence of mouth sores or pyorrhea, is secondary to the lowered tissue resistance.

Inflamed gums are not necessarily due to a scorbutic condition. Malocclusion may produce a mechanical irritation that cannot be corrected by diet and that must, when possible, be corrected mechanically.

I have referred repeatedly to a properly balanced or an adequate diet. This will vary somewhat for different people, and it will, of course, also depend on the age of the patient. If we limit ourselves to the vitamin and mineral essentials (an American diet does not vary greatly outside these essentials), the following can be recommended:

From 6 to 10 years: 1 quart milk, 1 egg, one-eighth head lettuce or its equivalent in cabbage or celery, the juice of one-half lemon mixed with sufficient freshly expressed orange juice to make one-half pint, and any desired amount of raw fruit or fresh vegetables. Raw tomatoes are very good, but they sometimes lead to gastro-intestinal disturbances.

From 10 to 18 years: 1 quart milk, 2 eggs, one-fourth head lettuce or its equivalent in cabbage or celery, the juice of 1 lemon mixed with sufficient orange juice to make 1 pint (to be taken in two portions, one portion at breakfast time, the other for dinner), and any desired amount of raw fruit or fresh vegetables.

Above 18 years: One-half to 1 pint of milk, 1 or 2 eggs, one-fourth to one-half head lettuce, 1 pint of orange and lemon juice as given under the preceding division, and any desired amount of raw fruit or fresh vegetables.

Let me repeat that this is not the *entire* diet. These are merely the essentials from a vitamin and mineral standpoint. The other constituents, such as meat, potatoes, bread and butter, almost invariably appear in the American diet as a matter of course and the amount consumed will be more or less automatically controlled by the caloric and reconstructive requirements.

It might be well to caution patients against obtaining their orange juice at the soft drink stands. These preparations are, I believe, not required to contain more than 10 per cent of orange juice. A number of our patients have objected to orange and lemon juice because they believe that this acid containing liquid causes acidosis. That this is a misconception has been recognized by scientists and physicians for many years. The acidity of citrous fruits is due to organic acids, largely citric acid. These acids are absorbed and are promptly oxidized in the body to carbon dioxid and water. These acids do not, therefore, reduce the alkaline reserve of the body any more than do sugars or fats. Citrous fruits also contain valuable minerals such as calcium, magnesium and potassium, combined with organic acids in the form of salts. These salts are absorbed, the organic acid is oxidized by the body tissues and the mineral constituents (calcium, magnesium or potassium) remain in the body in the form of bicarbonate. These bicarbonates (baking soda is an example of a bicarbonate) are alkaline in reaction and they increase the alkali reserve of the body. Thus, it develops that the acid-reacting fruit juices really lead to alkalinization of the body tissues.

The experiments described in this paper are not intended as a proof of any

contention. We do not claim, as yet, to have proved anything. The experiments are highly suggestive. They indicate that the importance of vitamin D may have been overrated and they suggest strongly that vitamin C is an important factor in dental disorders.

SUMMARY

1. Bacteria are probably involved in dental caries. They may act by virtue of the proteolytic enzymes that they produce rather than because they make acid. Some well known facts are hard to reconcile with the acid theory of dental caries.

2. A critical examination of the information obtained from 114 patients ranging in age from 6 to 60 years reveals the following:

A. Seventeen of the patients were free from dental disorders, and, of these, eleven were on a diet that contained ample vitamins. The diets of five of this group showed a slight deficiency in vitamin, perhaps insufficient to lead to any symptoms. One case, that of a boy 17 years of age, is hard to interpret. His diet was very deficient in vitamins and his health was poor, but his teeth were excellent.

B. Uncomplicated caries occurred in forty-seven of the cases studied. In these cases, there was not one perfect diet and not one diet that was deficient only in vitamin D, but twenty-seven contained plenty of vitamin D and were deficient only in vitamin C. From this, it is clear that people may have carious teeth even though they are ingesting an adequate amount of vitamin D. This entire group was on a diet deficient in vitamin C.

C. Caries associated with inflamed gums or pyorrhea occurred in twenty-five of our cases. In none of them was the diet perfect and none of the diets were deficient only in vitamin D. The diets were deficient in vitamin C and, in fourteen of the cases, this was the only deficiency.

D. Inflamed gums or pyorrhea or both, but without caries, occurred in twenty-five cases. Of these, fourteen showed pyorrhea. There was no exclusive vitamin D deficiency in any case. The diets were all deficient in vitamin C, and fourteen of these cases showed no other deficiency.

E. The calcium and phosphorus content of the blood varies with the age of the individual. The calcium and phosphorus values are normally from 11.5 to 12.0 mg. and from 4.5 to 5.0 mg., respectively, in children under 10 years of age, and from 10.0 to 10.5 mg. and from 3.0 to 3.3 mg., respectively, in an adult of 50.

TREATMENT OF MALIGNANT GROWTH OF THE ORAL CAVITY*

By CARLTON N. RUSSELL, M.D., D.D.S., Philadelphia, Pa.

WHEN I was but a lad, I received my earliest impression of cancer. One November afternoon my attention was attracted to a small group of men who were collected about the gateway of the house situated across the street from the one in which I lived. They were conversing in subdued tones with a tall dignified man and listened with bated breath to his words. He had been summoned from the city to confer with local physicians. Penetrating this rather august circle, I, for the first time, caught the word "cancer" and heard the darkly prophetic expressions which were to become only too familiar to me in the ensuing years. The consultant was Hayes Agnew, a surgeon of world renown. Some of you who are now present may be able to recall him.

I hastened home and plied my father with questions relative to what I had overheard. After some hesitation, he told me that cancer was a fatal disease of an unknown cause for which there was little or no help. "Many snows have melted since then," and still we cannot improve greatly on a layman's definition of that affliction.

Forty years later, I was to take my father to Baltimore for a conference with a noted specialist relative to this same malady, which was in his case located on the floor of the bladder. After a few days' observation, that old and significant word was again uttered. Grasping at straws, as one is wont to do when disaster hovers over his own head, I immediately began to peruse all the late books, papers, journals and periodicals that might perchance throw additional light on this subject, reviewing as well all literature of the last forty years. Much had been recorded and much had been discarded as useless. One article which had been running for some time in one of our medical journals attracted my attention. It dealt with the technic and results of fulguration of the villous growths in the bladder. Imbued with a new hope and in order to be more thorough in my investigation, I made a personal visit to the author of the paper, only to learn that he was about to publish later comments discouraging the practice, as the results had not justified the pain and discomfort to which the patients had been subjected.

Still hoping that some mistake might have been made in the diagnosis, as the general physical condition of the patient was seemingly good, I made another pilgrimage, and my father was placed in a New York hospital, where a Dr. Chetwood, who had operated him a few years before, removing a large stone from the bladder, had the patient under observation for two weeks. The prognosis was unchanged.

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Ten years previously, I had attended a meeting of the Rockefeller cancer research committee, and I recalled that, at that time, they seemed to be on the verge of some important discovery in regard to cancer. I decided to interview this committee to see whether anything had accrued from those past speculations. My conversation with the two members who were at the Institute was long, and they were most patient in their efforts to convey to me any knowledge that they had which might be of value. Many divergent methods of treatment were suggested, and some were tried, especially the injection of ascetic fluid which had been taken from a carcinomatous patient and properly prepared and sterilized at the Loomis laboratory, New York City. In due time, my father died.

Twenty years later, I again had the opportunity to attend a three days' session of this same committee in Philadelphia. Many papers were presented and discussed from various angles, but the outlook was about as encouraging as before. Much seems to be known about this disease, but just what the condition is remains shrouded in mystery.

Many cases could be cited which have passed under my observation, but a description of any one would be commonplace at the present time.

The unfortunate phase of the whole subject is that the word "cancer" has become synonymous with death, and when a victim becomes cognizant of the fact that he has a growth of this nature, all hope seems gone, and the labor of the surgeon becomes twofold: he must not only buoy up the drooping spirits of the patient, but must also fight the disease. It is assumed by the laity, and rightly so, that the great majority never recover.

What is this disease that knows no barriers, and thwarts all efforts to arrest its progress? Other diseases have more or less come under our control and their causes stand revealed so that we have been able to subdue them or retard their progress.

Typhoid fever has vanished from the death column. Diphtheria, smallpox, syphilis and many other once dreaded afflictions are now either prevented or held in abeyance. The prognosis may at least be a hopeful one. Not so with carcinoma; with a few exceptions, it thwarts our best efforts.

Its mortality has advanced with such rapidity that, at the present time, it claims two out of every ten that die in a single year. No race seems to be immune —no country is without the knowledge of this disease. In most homes, one or more are victims.

Napoleon conquered the civilized world. As I gazed at his sarcophagus, my thought was that he eventually succumbed to cancer. What is this disease that penetrates all parts of the earth? What is this menace from which all recoil with fear and trembling? It is not contagious. We may handle it with impunity. If it is transplanted from one living body to another, the diseased tissue will shrink, discolor, dry up and fall off. Its attempted transplantation in the mouse family, even among close relations, has not been successful. We seek its early diagnosis, and still, when we see it appear as a "pimple" on the side of the nose, we frequently watch it complacently, wondering what it is going to do, if anything. Its progress is so insidious that ere we are aware, it has suddenly changed and our attention is sufficiently drawn to this once innocent looking sore that treatment is instituted. Salves are applied for varying lengths of time, and, on account of its persistence, arsenical preparations follow. To keep time with the progress

of the ulcer, the electric cautery may later be used, violet rays, roentgen rays and other harmless methods, consuming valuable time, until the soft structures give way and the repulsive sight of exposed teeth and carious bony plates meets the view. The surgeon's skill and radium may now be called on too late to be of any lasting benefit.

Again, we detect the growth in its incipient state invading the epithelium covering the mandible, shooting upward its red projections where it has innocently rested for some time as an inoffensive area of erosion in the tissues. Possibly a mild astringent mouth wash was used for a while, but as the growth became no worse, all suspicion relative to its malignancy was abandoned. In this stage, it may remain in a dormant condition, until something occurs to stimulate its activity, when it rapidly invades the deeper structure and the glands, and probably irretrievable damage is done by metastasis. Lymphatic channels are not infrequently very early attacked, rapid loss of weight, marked emaciation and carcinoma-ptosis following. It is startling to note with what magic progress it runs from an operable to an inoperable state. Just how early transmigration takes place is most confusing. Superficial growth and malignant cysts that are apparently quiescent have been found, on removal, to have penetrated their physiologic boundries and impregnated structures along the course of the lymphatics. I recall a woman, a physician, who had both breasts removed on suspicion. There was a significant history of carcinoma in her family, and when a slight movable nodule appeared on one mammary gland, she immediately requested the chief surgeon at the Samaritan hospital, W. Wayne Babcock, to perform a radical operation on both glands; which was done under the surgeon's protest. This case goes to prove that the hopeless attitude toward these growths is not entertained alone by the laity. Two years later, this woman died of metastatic carcinoma. I knew the patient well and she had at no time given evidence of any symptoms that would suggest her oncoming trouble.

Just when metastasis occurs in any given case is of the utmost importance to the surgeon. Operative procedure will be of no avail, no matter how radical it may be, if transmigration to distant parts have already taken place. Again, we ask: What is this menace to the race? If a dictionary is consulted, we shall find it spoken of as a crab; the significance of which is doubtless its powers or habit to "dig in" by its numerous tentacles, which the laity considers its roots. Again, if we refer to the Almanac, we find it is mentioned as one of the twelve zodiacal signs or the sign of the summer solstice. This takes us way back to the very earliest conception, when Ptolemy assumed that all the universe and heavenly bodies revolved about the earth.

The probabilities are that carcinoma was among the very early human afflictions. Hoang-Ho, who was one of the rulers of China about 2,500 years before the Christian era, caused to be compiled the names and remedies of some of the diseases of that age, and, among the many enumerated, that of syphilis, rheumatism and carcinoma were distinctly described. Strange to say the salicylates were used at that remote period. They doubtless had their treatments for cancer, with probably a lower death rate.

The fact that this disease is rapidly increasing proves that it is not being successfully combated.

During the past summer, while visiting the British Museum, I viewed the results of the recent excavations of Ur.

Among the interesting articles exhibited were metal spears, remnants of a wagon; the remains of an ox which exactly resembles our present day animal of that species; the remains of the queen, together with her crown of gold leaves; beads, the workmanship of which would rival most of our present-day products.

That which was of especial interest to me was the remains of a huge flattened head probably of one of her guards, he being of the sixty servants, both male and female, who were put to death and interred with her in order that they might be of service on her long journey to her future state of existence. The curious and most interesting, attractive thing about this head, to me, was the existence of a large pulp stone and the unmistakable signs of a nodular exotosis on one of the roots of his teeth. Now if these pathologic conditions, with which we are so conversant at the present day, were in evidence at that remote period, why not carcinoma?

If we consult a textbook of surgery for a modern definition of cancer, we read that it is a mass of newly formed embryonic tissue which tends to persist, performing no true physiologic function but continuing to a fatal termination.

The tissue of a neoplasm has its prototype in the human body either adult or embryonic and its cells invariably originate from preexisting cells of the body. While the specific cause of a neoplasm is not known, there have been given many possible causes by different investigators. The so-called inclusive theory of Cohnheim assumes that an excess of embryonic cells were created during intrauterine life, and that those cells which were not used in the construction of the fetus remain in the body in a latent state, until some irritation prompts their development.

There are many striking examples in which heredity might be suspected as being a predisposing cause; but during later years, this belief has not been well verified, and it is probably less important than was formally believed. There seems to be no doubt that injury and irritation are constant causative factors. There are many examples in which a single injury to the face has resulted in sarcoma, especially during the early decades of life, while carcinoma follows long, continued irritation. The many examples of epithelioma of the lip caused by the use of pipes and cigarets are but too apparent to be denied. No matter what other factors may be involved in the development of a cancer, one stands alone, and far above the rest; namely, irritation. Carcinoma occurs most frequently, in the order named, in the stomach, the uterus, the esophagus, the breast, the mouth and the rectum. When we take into consideration the constant abuses to which the stomach is subjected, it is but little wonder that the disease attacks that cavity so frequently. The part of the stomach most subjected to irritation is the pyloric sector, and it is in this area that development of the growth most frequently occurs. The esophagus is the gateway for food in the human system and is first to come in contact with the multitude of irritants which are swallowed.

Malignancy of the cervix of the uterus is of such startling frequency that it is of the utmost importance that immediate and careful repair be carried out after completion of labor, even if the lacerations have been of the slightest nature. Second and third degree lacerations are, or should always be, corrected. The time to cure a cancer of the uterus is to prevent the existence of a condition from which it might spring. The physician who is in a hurry to terminate labor and, in

order to accomplish this end, prematurely applies forceps, frequently creating damage which is left without any attempt at repair, is creating a future site for cancer. In about eight of the ten women who succumb to malignancy, the location of the tumor is in the uterus or at its cervix. When there is a cauliflower growth, or a chronic ulceration of the cervix, prior to its becoming attached to the adjacent tissues, there is more hope for permanent recovery after a complete hysterectomy than when the disease has penetrated the surrounding structures and become fixed and metastasis has occurred.

The mortality in operation on the uterus is about 70 per cent.

Carcinoma of the gallbladder is caused by long-continued irritation from gallstones. Habitual constipation and hard masses collected in the lower rectum are precursors of malignancy. Constant trauma from malocclusion may, and probably does, produce low-grade and long continued irritation along the teeth, instituting precancerous conditions.

The use of hot condiments, smoking, the careless application of phenol, gingivitis, the presence of jagged teeth, indifferent dental instrumentation, penetration of broaches or canal fillings beyond the apex into the periapical tissues, the presence of abandoned roots or unerupted teeth that become infected and cause a pathologic condition or any condition which causes local irritation, enter into a classification of precancerous conditions.

The decline of life seems to be the most propitious period for this disease to manifest itself. It has often been a question in my mind whether or not it is more than a simple expression of retrogressive changes occurring where the differently constructed tissues unite, with weakened junctions resulting. Garments are always more apt to give way at the seam than at any other location. Epithelioma of the squamous type occurs where the skin and mucous membrane meet or at the junction of two varieties of epithelium. This is more especially demonstrated on the lower lip.

The first evidence of its existence is usually a small indurated nodule just under the epithelium.

Later, an irregular ulcerated warty surface develops from which there is, occasionally, an exudation denoting ulceration within a surrounding indurated border. This leads to incrustation, beneath which, when the scab comes off, a developing cancer is plainly seen. Crile states that, although the cause of cancer remains unknown, many of its phenomena have been carefully studied. It occurs in every climate, among all mankind, both savage and civilized, in both wild and domestic animals, carnivorous and herbivorous, in birds, fishes, reptiles and even in the oyster. Throughout nature, the histologic picture of any definite cancer is the same.

Embryology has contributed many interesting lines of possibilities.

Cancer or epithelioma of the chorionic villi (trophoblasts) has been referred to as malignant chorio-epithelioma. This was a form of epithelial growth which took its origin from the epithelial covering of the chorionic villa or from chorionic cells in migration, and occasionally was so malignant that hardly an organ of the body was protected from destruction, or the formation of metastasis in it.

It was a very remarkable, but quite certain, fact that the ordinary chorionic epithelium in every normal human gestation developed a conspicuously destroying and eroding tendency.

If a parasite were postulated to account for chorio-epithelioma, its advo-

cates would find difficulty in escaping from the conclusion that such a parasite was not also required to stimulate the implantation and development of the normal egg.

Certain embryomas or teratomas were encountered in the sexual organs, ovaries and testes. Occasionally, these tumors were very malignant. They destroyed, recurred and formed metastases in distant organs.

Thus we could go on—groping for some definite cause of malignancy, from cancer houses to embryonic theories, without arriving at any satisfactory conclusion.

The laboratory man who has submerged himself in the quicksands of his own theories has contributed largely in the destruction of many empiric cures by discrediting by scientific facts the fallacies of the quack and the enthusiasm of those who are misled by the advent of a new panacea. There is one fact that we have satisfactorily established to combat this disease which has so completely baffled medicine and so tortured the human race. We have decided and are rapidly proving that there is a so-called precancerous stage. The very incipiency of carcinoma may be characterized as a stage curable by either surgery or radium.

Crile assumes that cancers obey some general law of growth, and that this law applies equally well whether it be cancer of the internal invisible organs or of the external and visible parts. If it can be shown that cancer of any particular part of the body follows a certain sequence of events, this would be an example of the law of its growth. He states that it was not necessary for Sir Isaac Newton to observe the fall of apples from more than one tree to conceive the law of gravitation.

Most authors and experimenters of the present day stress the great necessity of eradicating causes of irritation, especially in areas that are known to be frequented by malignant growths. The public at large is being instructed relative to what may be classified as the precancerous state. The coming generation will, in all probability, reduce the frequency of these growths by availing themselves of the instructions which they are now receiving in the public schools relative to the proper care of the mouth and the advisability of frequent examination. The hope of the future lies in the prevention of cancer rather than in its cure. The advent of the new specialty, oral hygiene, will aid greatly in correcting many conditions of the oral cavity which would otherwise be considered pathologic. Mouths of the past and also those of the present have been the hotbeds of bacteria of numerous varieties. The resistance of the tissue has been so wofully reduced that retrogressive changes find a most fertile field for development. Gingivitis in its various forms should be adequately combated if not wholly prevented. At the present day, we are realizing more and more that irritation, in its different stage of severity, is doubtless the precursor of the majority of cases of cancerous reaction. Without attempting to enumerate the many, many causes of irritation in the mouth and its associated parts, I would like to call attention to one factor which is greatly overlooked, but probably should be first considered in the precancerous classification, namely, malocclusion. I can't recall seeing a case occurring in mouths in which the forces of mastication are equally distributed or have been but slightly altered. Malignancy usually appears in mouths that are foul or have been otherwise neglected.

Not infrequently, we discover retrogressive tissue changes about the abutments of bridges, either from recession of gums, the presence of poorly fitted crowns or undue force against the tooth until it becomes loosened, when, on removal, a granuloma is in evidence, or suspicion of an incipient cancer. Extractions are always followed by more or less change in the alinement of the teeth. Faulty fillings may cause an imperceptible readjustment of the planes of the denture, which, when continuing for years, causes a low-grade inflammation sufficiently dangerous to be classified as a precancerous stage. We know that scar tissue undergoes many changes, some of them cancerous. Therefore, anything that produces scar tissue, such as lacerations from extractions, operations for the removal of badly impacted teeth where much trauma has been produced, incisions for abscesses, etc., causes a precancerous condition to develop.

Few cancers occur anterior to the cuspids. Therefore, we are within our rights to infer that trauma from malocclusion or extractions may be a predisposing cause, as most of the difficulty in the removal of teeth occurs in the bicuspid and molar areas and just there malignant changes are usually found.

The dentist and patient should be in closer cooperation. There should be a method or system adopted by the latter so that he can maintain some comprehensive rating of the mouth of his patients. If it were once made clear to his clientele just why these records were kept and the possible dangers of malignant growth following neglect of the mouth, I believe that, with the present fear that most all people entertain for cancer, hearty cooperation would be afforded. The dentist is constantly examining or working in the mouth for various reasons, and he is far better qualified to record dental impressions, at least, as to the general hygienic status of that cavity. He should feel that it is incumbent on him to refer throat conditions or suspicious looking tongues to specialists along those lines. Few practitioners of general medicine make what might be called routine mouth examinations, and when the patient eventually does reach the throat or mouth specialist, something has taken place sufficiently irritating to draw the patient's own attention to the condition; but much valuable time has been lost. Because of the frequency of a patient's visit to a dentist, the latter is in a better position to keep continuous records of mouths than any other specialist.

As might be expected, a disease so terrible in its effects and, withal, so common has, in all ages, engaged the best attention of those who have devoted their lives to the study of disease and its treatment, and many specifics, or pretended specifics, in the shape of powders, plasters, paint, ointment or paste which were to have robbed the disease of its terrors and death of its prey have, at various times, been puffed into notoriety. But the specifics and their inventors have lived out their short day of glory, and would have been forgotten were it not that some new cancer-curer appears on the scene every now and then, and holds out one of the old specifics to those who may be, or fear they may be, suffering from cancer.

It may be alleged that treatment adopted by some of these cancer-cures appear to be attended with extraordinary success.

As a rule, the cancer-curer is superior to pathology, and finds it convenient to ignore its teachings. To him, every swelling or "lump" which appears in any part of the surface of the body, whether

an enlarged lymphatic gland, an adenoid growth, a fatty tumor, a simple cyst or a wart is alike raised to the importance of a cancer, and the cure is claimed as a marvelous triumph of science over nature. An escharotic paste made of powdered asbestos and pure sulphuric acid flourished for some time, in about 1876 or thereabouts, under the name of Michel's specific for cancer. Much damage of the tissues resulted; but what was far more unfortunate was the delay before patients eventually applied to the proper channels for treatment.

With the death of the inventor, the popularity of the treatment also died.

Even unsuccessful attempts to discover the cure for cancer are entitled to some share of commendation. Various ways of pursuing the inquiry have occurred to me. It was first my intention to have given an abstract of all the treatments which had been recorded on the subject of cancer, beginning with the earliest writers and tracing the subject down to the present time. In this, I had made considerable progress, but finding that what had been said consisted mostly of loose conjecture on the nature of the disease and a list of medicines that they had repeatedly used without success; that in general their works were copied from preceding writers, and that they universally concluded by admitting that the disease was incurable, my purpose was abandoned, as the results would have been more curious than useful.

Before the time of Hippocrates, Celsis and Astium, efforts toward the destruction of cancer were mostly local, and consisted principally of the application of salves.

The idea of internal remedies seems not to have been considered. There is no occasion to mention an endless number of popular receipts for the cure of cancer, some of which were purchased for large sums of money, especially if the name of some person of distinction were attached to them; all of these having fallen into discredit, most of them being forgotten. Among some of the principal ingredients of the salves were lead, hyosgamus, diphrix (which was a refuse left in making bronze), copper sulphate, sumach. Piseo, whose works were published in 1579, says that cancer returns unless all its roots are cured, which is impossible when it is seated in the uterus, but that its increase may be prevented by diet and medicine. It is often provincially said that cancer always returns, unless the "strings" are clearly removed, and empirics often speak of the claws of cancer as if it were a living animal.

The knowledge of morbid structure does not necessarily lead to the knowledge of morbid action, nor does the knowledge of morbid actions, diversified as they are, lead to the discovery of that peculiar change of structure which may be the consequence of such action. Yet a discovery of the cause of the action, with the effects produced by its being made, together with the means and manner in which they are produced, would be of such advantage that we might proceed with confidence to the discovery of a method of cure by correcting or destroying the cause through preventing or suppressing the action, and ultimately its effects, or by rendering the constitution capable of resisting the influence of the disease.

Arsenical pastes were largely used. The cancerous area only was covered and the arsenic allowed to "eat in." Much pain was occasioned by this process, and the patient was given doses of opium sufficient to control the distress. It is also thought, if not proved, that those who became corpulent or fat, through indolence or

indulgence, were more liable to cancer and many other diseases than those who were thin from eating little and exercising regularly. In the Sixteenth Century, it was admitted that cancers more frequently affected parts concerned with the venereal appetite than others. The data on this theory might be taken from those who lead a life of prostitution, but these women die at so early a period of their lives, few of them reaching the thirtieth year, that the opportunites of making correct observations are generally lost. Persons who are hygienic in their personal habits are very much less liable to develop cancer. It was observed that the disease is very rare in nunneries, but it will be recalled that, together with a life of celibacy, there is practiced a constant control over all other appetites.

Hemlock extract was much used internally by the ancients and the so-called hemlock baths were popular in Germany.

Occasionally, the parts were given a local application of solutions consisting of tincture of equal parts of salt ammoniac and iron in rectified spirits of wine, with the addition of oil of vitriol and oil of tartar. Other preparations which were locally applied to cancerous areas consisted of equal parts of arsenic, copper tin and mercury, distilled in spirits of wine, and afterwards in oil of vitriol.

Dr. Jenner, in his day, spoke enthusiastically relative to the internal and external use of carbonate of iron and he cited several cases in which he felt that satisfactory results had been obtained.

Another preparation of amusing interest and which met with some consideration was the application to the cancer of the ashes of a toad which had been sealed, while living, in an earthen pot with 2 ounces of oil of sulphur. Still another recipe is taken from an American magazine dated 1798 and reads as follows: burn half a bushel, or 3 pecks, of old field, red-oak bark to ashes. Boil the ashes in 3 gallons of water until it is reduced to 1. Strain that off and boil it to a third, which will be of the substance or consistency of cream or buttermilk. Spread a small quantity of this on a piece of lint or silk, not bigger than the the place or part affected, and apply it thereto.

The constant application of this was claimed to assure a cure in thirty days at the longest, provided the cancer was where the remedy could be freely applied.

Cases of cancer of the lips were reported cured by an ointment made from boiling oil in a copper vessel newly tinned inside for a space of three times twenty-four hours. This was applied to the sore, and the patient was cured in fifteen days.

I believe that some day this disease will be conquered, but I don't think that a cure will necessarily come from within strictly professional ranks. Most of us are so restricted by ethics that we are quite reluctant to "speak out of turn."

It is much to be wished that persons regularly educated to the profession should not be so decided in their opinions regarding the impossibility of curing cancer, as if the resources of science and art were exhausted, and that they should not shut their eyes to or treat with disdain the accidental discoveries which may be made by illiterate men.

SOME REASONS WHY PENNSYLVANIA NEEDS A STATE CANCER INSTITUTE

1. From 1906 to 1928, the death rate has dropped from 16 to 11.4 per cent. For the same period, the average expectation of life has increased from 46 to 60.

In the same period, the death rate from cancer has increased from 58.9 to 95.4 per cent.

The greatest increase in cancer has been in the peritoneum and intestines (100 per

cent); next in the female genitalia (48 per cent); next in the breast (40 per cent).

2. Seventy per cent of the patients dying did so without hospital service. How many of these patients really had a "square deal" is a problem.

3. About 15 per cent of the intra-abdominal cases in hospital were not studied by roentgen rays. Did they get all possible help?

4. There are at the present moment about 100,000 cancer sufferers in the state.

5. Pennsylvania is twelfth from the highest state in cancer death rate.

SOME WAYS IN WHICH A STATE CANCER INSTITUTE CAN HELP

1. Provide a haven where cancer sufferers can secure the best care and study that the science of the time affords at the hands of skilled specialists whose sole work is the study and treatment of cancer and who will be armed with adequate modern equipment.

2. Afford opportunity for intensive clinical research, hoping to discover, if not the cause, at least many things which will help prevent cancer, and many improvements in treatment.

3. Serve as an educational center.

(*a*) From which proper and authentic information can be given to the public;

(*b*) From which proper information can be given to the medical profession as to standardized methods of treatment and as to authentic improvements in treatment;

(*c*) By affording opportunity for physicians in the state to take postgraduate studies in any desired phase of cancer.

(*d*) By showing the results that may be attained by high professional skill and adequate equipment.

4. Serve as a consulting center to which obscure cases can be sent for more careful and detailed study by roentgen-ray and laboratory methods than may be available in the patient's home.

CORRESPONDENCE

Jan. 14, 1929.

Dear Dr. Russell:

On the whole, the majority of clinics of the world feel that if there is no glandular involvement, the chances of a 5-year cure are 70 per cent, and if there is, the cures drop to 50, 20 and 10 per cent.

This, of course, means that the local growth can be removed.

In cancer of the skin and in cancer of the lip, complete removal, if there is no glandular involvement, offers almost 100 per cent, but in cancer of the tongue and cheek it does not. Glandular involvement practically makes a cancer of the cervix or body of the uterus hopeless, and it is very difficult to estimate what is an operable cancer here. Radium seems to offer more than surgery in cancer of the cervix, except in the earliest cases detected by the microscope only. If the glands are involved in cancer of the lip, the cures drop to 50 per cent, in cancer of the tongue to 10 per cent. In cancer of the stomach and colon, involved glands make the prognosis almost hopeless.

My figures go back to 1890 and on to 1923—5 years ago.

Very sincerely yours,
Joseph C. Bloodgood.

* * *

Dear Dr. Russell:

I am rereading your letter and find that you are interested in the mouth only. I have just been over the ultimate results of cancer of the lip, tongue, floor of the mouth, gum, cheek, hard palate, soft palate, uvula, pharynx, larynx.

On the whole, if the local lesion in the oral cavity is small and can be thoroughly eradicated with knife, cautery, diathermy or coagulation, and there is no glandular involvement, the prognosis is excellent—in the lip at least 100 per cent, in the others less. But, in cancer within the oral cavity, exclusive of the lip, involvement of the glands is a very serious affair. On the whole, 10 per cent are living at the end of five years without a recurrence. Involvement of bone, except secondary to the gum, makes the condition practically hopeless. My experience teaches me that nothing can compete with the complete radical removal with knife, cautery, diathermy or coagulation of small cancers within the mouth. The area to be removed practically never mutilates. I have 5-year cures in practically every locality, except the soft palate, uvula and tonsils. However, in cancer of the mouth, infiltration beyond the area excised is a more common cause of failure to cure than involved glands, and that is why radium properly placed and X-ray radiation promise more, at least for comfort, than extensive surgery. I cannot find a verified 5-year cure of spinal cell cancer of the oral

cavity in which radium or X-rays alone have been the method of treatment. In the past ten years, I have had a large number of very small cancers of the oral cavity.

Very sincerely yours,
Joseph C. Bloodgood.

The dentist is constantly examining mouths, probably more so than any other member of the healing art; hence his added responsibility to society. There is no law nor code of ethics which prevents him from making a thorough examination of the tonsils, soft palate, larynx, etc., which places him in a position to at least suggest the advisability of further oral treatment. The great majority of the general practitioners of medicine are guided by the subjective symptoms of the patient and, not infrequently, much more formidable conditions are overlooked until they have made disastrous progress. If the dentist records nothing, he is at least in a position to make some very valuable observations. It is rather difficult to overcome a long established habit, and it seems second nature for the general practitioner of dentistry to concentrate all his attention on the teeth alone. With his present-day equipment, he is as well prepared to make almost as complete an examination of the oral cavity as is the man who is specializing along those lines.

The patient, while spending hours in the dental chair, frequently asks leading questions which, to the observant operator, should arouse suspicion. A patient over 40 may state that for some time past he has been suffering from a sore throat accompanied by sharp pains which seem to be located in either the pharynx or the larynx. The hoarseness may have increased until the voice is lost and the growth is rapidly progressing upon the lumen of the larynx, when breathing may become embarrassed.

In the extrinsic variety, dysphasia quickly supervenes, the lymphatic glands are early involved and operation rarely prevents a fatal termination. The intrinsic cases are much more hopeful; in fact, they respond favorably in about 80 per cent of the cases, if an early operation has been successfully performed. The cervical lymphatics seldom are involved until the tumor begins to break down. A light thrown in the throat will frequently reveal the tumor located in the supraglottic space. While there are other affections of the larynx, it would be safe to classify all, from a dental attitude, as malignant. Then, if a mistake is made, it will not be so costly. I teach my students to consider all growths of the mouth as malignant until they have proved themselves otherwise. The valuable time frequently lost waiting to see what it is going to turn out to be too often proves most disastrous.

There is no disease in which Nature so subtly clouds its onset as in carcinoma. Many cases of leukoplakia are constantly passing under the observation of the dentist, unobserved and unreported. Not all leukoplakic conditions terminate in cancer, but enough have done so to obligate the practitioner to refer them for further observation and treatment.

A PHYSIOLOGIC VIEW OF "ACID MOUTH"

By GEORGE C. McCANN, D.D.S., Danville, Ill.

WITH the shifting claims regarding both the acid and the alkaline value of dentifrices, as well as the p_H value of saliva in current ideas concerning correction of oral conditions and protection of the mouth, it seems that a few clinical observations of facts as we find them might help solve the problem, which test tubes and the microscope have not proved. The saliva, being a direct elaboration from the blood by the special function of the salivary glands and ducts, does not for long hold an unbalanced position and as is well known "returns to its normal p_H value."[1] This value does not seem to insure mouth health under certain conditions and this suggests that systemic relations are involved. Neither does the local application of acid or alkaline dentifrices, as is the occasional practice, correct or prevent mouth manifestations, although manufacturers are "blatant in their announcements."[1] This further proves that there is an underlying systemic relation. Constitutional causes have often and long been referred to. The study valuable for practical application should lead to the condition that accounts for these manifestations in the mouth.

As stated, close clinical observation and histories of past experiences support the view that potency does not lie in the p_H value of mouth secretions alone. There is a physiologic function rarely referred to, which undoubtedly carries with it the environment that is associated with the average healthy mouth. It is the volume and profuseness of the secretions as they appear, in the form of a natural sanitation and drainage of the field in question. In this tabulation, we have many of the normal physiologic requirements, as well as many clinical facts: 1. Profuseness in good mediums is related to the healthy mouth. 2. Profuseness suggests an unrestricted blood supply. 3. Profuseness suggests that systemic relations are well balanced as to health, diet, elimination and nerve tension. 4. Profuseness by mechanical flotation or irrigation, which may be called sanitation, provides the greatest potency that may be had from mouth secretions. By this sanitation, every minute of the day, we have less precipitate and localization of the colloidal substances. We have flotation of bacteria, which prevents localization and permits digestive and resistive action in the enzymes of the saliva.

To sum up the values thus set up, one suggests drainage, which is a fundamental principle throughout the body. Therefore, any break, biochemical or pathologic, that interferes with the sanitation, drainage or cell elimination in the mouth might be regarded as a primary cause in the subsequent pathologic process of the oral activity. Acidosis, one of the many constitutional underlying causes, undoubtedly is an indirect functional reflex.

1. Editorial, J. A. M. A., 92: 899-900 (March 16) 1929.

Acidosis may be regarded as a biochemical irritant. This break reaches the functional centers through the sympathetic nervous system, and tracing this system to the mouth, we find that it has control over the secretions, acting by constriction or tension *only*. Herein lie obscure etiologic conditions that we many times visualize in the mouth. This constricted, and thus passive, bed of capillaries offers an area for the localization of bacteria producing "acid mouth" and low tissue resistance. Many other systemic diseases acute and chronic respond in the same manner, which makes the subject one of medical importance.

The condition of the mouth is an early index to functional breaks and should have the "expert attention of the dentist and physician."[1] The dentist's problem lies largely in recognizing these reflexes in his daily observations, remembering at all times that oral or bodily hygiene is merely delaying the degeneration of tissue, and that preventive medicine may correct many ills and at the same time protect his field.

Space and the brevity of this introduction prevent presentation of case histories and further proofs of this hypothesis. It may be stated that all alkaline medication, local or systemic, should be considered on the basis of their value in reducing tension rather than their action in producing direct chemical changes. It is a coincidence that many of the treatments and diets that are used with the view to chemical change also have a known depressant value, and many of the p_H values in solutions (blood and saliva) observed today may be due to the indirect release of tension. The mouth is very responsive to these treatments from a systemic source and they are therefore valuable when the theory of a functional etiology is accepted.

THE DIRECT APPROACH TECHNIC IN MANDIBULAR BLOCK ANESTHESIA*

By ASHLEY W. LINDSAY, D.D.S., B.Sc., F.A.C.D., Chengtu, China

THIS paper is an attempt to introduce to you the work done on mandibular conduction anesthesia by Dr. Lindsay at the University of Toronto Dental School during 1927-1928. His thesis has been printed in book form.

Unfortunately, Dr. Lindsay could not be here to present his work because he had to return to China where he occupies the position of dean of the Dental School of the Union University of Chengtu, China.

The technic of mandibular conduction anesthesia can easily be divided into two groups: 1. That advocated by Braun, Blum, Fischer, Posner, Reighmuller, Smith, Seidel and Thoma, with which you are all very familiar. These men advocate the use of bone as a landmark and as a guide. 2. That advocated by Craven, Levitt, Lindsay and Pageix. These men use soft tissue and

*Read by Alan C. R. McLeod, D.D.S.

*Read before the Research Session at the Sixth Annual Meeting of the American Association of Dental Schools, Chicago, Ill., March 26, 1929.

soft tissue folds in the retromolar region as landmarks and guide.

The first group, you will readily admit, are more widely known and followed. For convenience, their technic might be termed an indirect approach technic, i.e., the long axis of the syringe changes its direction a number of times during the injection because of the fact that the bevel of the needle is made to glide along the bones of the lingual side of the ramus of the mandible. The second group have been termed direct approach technics although only one of these advocates—Lindsay—has used such a term in describing his technic.

This direct approach technic in mandibular conduction anesthesia refers to that method whereby the needle approaches the position in which the solution is to be deposited along a straight line and without the lateral movements usually associated with the indirect approach technics.

The most important items in mandibular conduction anesthesia, and seemingly the most disputed, are the landmarks and the point of injection.

The literature yields four direct approach technics, which are listed in the order of their discovery:

Pageix, of Paris, in 1906 developed a technic in which he uses as a landmark the pterygomandibular ligament and injects outside this ligament, from 1.5 to 2 cm. above the occlusal surface of the lower teeth. The barrel of the syringe is held throughout the whole operation over the midline of the lower jaw.

Levitt, of New York, in 1924 and again in 1928 described a method whereby he made use of the pterygomandibular ligament. His point of injection is outside this ligament, i.e., in the pterygomandibular depression at a height equal to one-half the distance between the upper and lower teeth in the widely opened mouth. The syringe is held over the cuspid-bicuspid region of the opposite side of the lower jaw.

Craven, of Melbourne, in 1927 made use of the pterygomandibular ligament and the pterygomandibular depression which he wrongly called the retromolar fossa. His point of injection, to quote his own words, "is a little below the tuberosity, and the syringe is held over the cuspid-bicuspid region of the opposite side."

Lindsay, of Toronto, in 1928 has given more definite landmarks and recognized structures which aid in determining the position of the puncture point in the horizontal and the vertical planes. He recognizes the pterygomandibular ligament, the pterygomandibular depression and the structure called by him the buccal pad. From these landmarks, he determines the pterygotemporal depression and the space of the same name, through which the needle must pass to enter the pterygomandibular space—the object of all technics.

ADVANTAGES OF THE DIRECT APPROACH TECHNIC

1. The needle, being advanced in a straight line, will not bend, and thus breakage of needles in the tissues will be minimized, and should be entirely prevented.

2. As the needle passes through fewer muscle fibers and no tendon, it will cause less immediate discomfort to the patient.

3. The length of the needle passed into the tissues is shorter.

4. The gage of the needle can be comparatively smaller (25 gage).

5. There is less probability of passing the needle too far posteriorly.

6. There is a smaller chance of depositing the solution in the body of the internal pterygoid muscle.

7. There is no chance of tearing the periostium.

8. There is little possibility of after pain or trismus.

9. The technic of locating the initial puncture, inserting the needle and securing consistently rapid anesthesia is simpler.

Concisely stated, the steps to be taken to secure anesthesia by the direct approach technic may be outlined as follows:

1. Determine with the eye or the finger the direction and the extent of the pterygomandibular ligament.

2. Distinguish the true outline of the true apex of the buccal pad, from its surrounding tissue.

3. Form by palpation with a suitable instrument the pterygotemporal depression, determining the line of insertion of the needle.

4. Locate the puncture point and, if desired, mark it.

5. Dry, sterilize and, if desired, desensitize the area about the puncture point.

6. Stretch the buccal pad in Type III where it is possible to bring the true apex of the pad into the pterygomandibular depression. In other types, it is not necessary to stretch the pad. This refers to the case where the false apex reaches the pterygomandibular ligament.

7. Insert the needle at the puncture point and advance it with the barrel of the syringe resting in the predetermined line. Usually, this line will be projected toward the opposite side of the mouth to that on which the injection is being made.

8. When the needle has been inserted from one-half to three-quarters inch, this depending on the distolingual inclination of the retromolar area and on the size of the jaw, begin slowly to inject the solution. Deposit 1.5 c.c., then slowly withdraw the needle two-thirds of its depth and inject from 0.25 to 0.5 c.c. for the lingual nerve.

9. Slowly withdraw the needle completely.

THE USE OF PLASTIC FILLINGS*

By J. D. McMILLAN, D.D.S., Macomb, Ill.

IN presenting this paper, I do not expect to teach any facts that are not already well known, but rather to uphold materials that have had, and still have, a large place in dentistry in preserving the natural teeth of the human race.

In selecting a filling material in any given case, there are so many things that must be taken into consideration: First, let us discuss the use of plastic fillings in preserving the deciduous teeth until the time arrives when they have served their purpose and are ready to turn their task over to their stronger and more sturdy successors, the permanent teeth.

In a position where discoloration is not noticeable, I find copper amalgam a valuable material in filling deciduous teeth, it being very plastic, easily manipu-

*Read before the Illinois State Dental Society, Springfield, Ill., May 15, 1929.

lated, slow setting and nonirritating. It neither expands nor contracts and is very effective in preventing the recurrence of decay, so common in cases of malnutrition, which invariably means susceptibility to decay.

In selecting a filling material for the anterior deciduous teeth, where the position requires a material that will match the natural teeth as nearly as possible, some one of the many filling porcelains, (so-called) would be indicated. The desired result and the percentage of successes will be in direct ratio to the time the work of repair is undertaken. If the right thing is done at the right time, all is well.

In the use of plastic fillings in the permanent teeth, let us determine what are the characteristics of a filling material for the anterior teeth. The twofold object, I would say, is imperceptibility and endurance. Imperceptibility carries out the idea that it is art to conceal art, concealing from view all evidence of existence, duplicating in color, in light refraction and in light reflection the natural tooth that surrounds it.

Endurance implies hardness, strength, resistance to attrition and insolubility in the mouth. Very good fillings can be made with the many silicious cements on the market, if only the operator will acquaint himself with the technic which that particular material requires. Many operators will ruthlessly condemn some one material because they have not developed the proper technic in its use.

We must not claim permanence in our operations in the use of silicates, for, as yet, no permanent silicate has been found. But having an understanding with our patients that the filling must be replaced occasionally and that the length of time that replacement will be necessary will depend on the chemical action of the fluids of the mouth, we will have nothing to regret later. A silicate filling that I inserted for a dentist at a clinic was in remarkably good condition twelve years later. I know many men in our profession who condemn silicates as something to be used only in exceptional cases; but their use has become widespread, and as science and art have the elements of growth and will unfold and expand throughout the coming years, I hope that some day these materials that mean so much in conserving the nerve strain of both patient and dentist will have been perfected so that their uses will meet the approval of the most exacting operator.

Another material used in the preservation of the dental organs is amalgam, and some one has said that perhaps if more of it were used, more teeth would be saved, as would also our reputations.

I am convinced that, with the technic in cavity preparation as taught by that teacher of teachers in dentistry, the late G. V. Black, and with his scientific research in the manufacture of alloys, we have today many alloys on the market which are much more efficient in making restorations than they are given credit for. I have always had a high regard for properly made amalgam fillings, since seeing the late C. P. Pruyn demonstrate at more than one clinic what could be accomplished by painstaking effort and observing how he approached his task with the confidence that comes only through doing the same thing successfully many times.

It would seem almost out of place even to suggest a technic; but as some one has so well said, "Man advances as he mingles his thoughts with his labor." In the last decade, we have come to the conclusion that better results are obtained by using a more plastic amalgam during

the packing into the cavity than was formerly used. We now recognize the importance of orderly packing with the force equally applied, and better adaptation, strength and stability have resulted.

I sometimes wonder how many dentists are employing the same old technic in inserting the amalgam into the cavity, that was used forty years ago, and are using what was termed a dry mix. Ten years ago, when this society met at Peoria, William E. Harper, of Chicago, presented a paper on the subject, "Is a Non-Leaking Filling Necessary to Tooth Salvation When Amalgam Is Used?"[1] I wish to refer to a few of the many good things that he pointed out, and I do so with the hope that many will read the paper when they go home, and I would suggest that each component society have it read at one of its meetings. The high purpose of the society should be to disseminate knowledge, and often in the larger meetings, many fail to take cognizance of such valuable information.

The first point in Dr. Harper's paper that arrested my attention was the statement that more than 90 per cent of the amalgam fillings made for him for test purposes leaked as soon as subjected to air pressure from within. He then, step by step, shows how such deplorable results from faulty technic may be overcome, so that, instead of more than 90 per cent faulty fillings, with the proper procedure less than 10 per cent would leak under air pressure. I have been following Dr. Harper's technic assiduously, and the results have been most gratifying. It requires two or three minutes to make a thorough mix, so necessary to attain that plasticity most favorable to adaptation. I find in large cavities that even extreme plasticity in the first half of a filling is desirable in securing adaptation. Excess mercury may be removed by thorough packing and condensation.

The proper insertion of an amalgam filling requires skill. We must have the proper proportions in the different alloys of the manufacturers, as either extreme makes amalgamation unfavorable. In mixing, thoroughness means so much in getting the right plasticity. Also, the uniform condensation in packing the amalgam into the cavity, and the orderly stepping of the plugger, all are important contributing factors in the technic of manipulating the different alloys on the market. The more nearly we restore the occlusal surface of the tooth anatomically, with due regard to the importance of the contact point, the marginal ridge and occlusal planes, the more nearly can we hope to render to our patients a degree of permanence in our work, as well as assuring comfortable mastication of food.

1. Harper, W. E.: J. N. D. A., 6:1099 (Dec.) 1919.

ADDRESS AT THE UNVEILING OF A TABLET TO MARK THE SITE OF THE FIRST DENTAL COLLEGE IN THE WORLD*

By C. N. JOHNSON, L.D.S., D.D.S., Chicago, Ill.

THE present occasion is one in which the citizens of Baltimore, the officials of the Baltimore College of Dental Surgery and the University of Maryland may well take pride. It is also an occasion which must appeal to teachers of dentistry everywhere, and in fact to the entire dental profession of the world. On this spot, rendered sacred by its associations, marked by this tablet, there was inaugurated a movement nearly a century ago that was destined to exert a profound influence on the development of dentistry.

Among all the splendid men who have graced the teaching ranks in dental education, there are two who stand out conspicuously as entitled to the major part of credit for their vision, their initiative and their splendid courage in the face of obstacles that would have daunted less heroic souls. The names of Horace H. Hayden and Chapin A. Harris will live as long as the history of dentistry is written. Hayden, born in 1769, had behind him that maturity of judgment which was so greatly needed in launching any new and untried movement, and Harris, born in 1806, brought into the picture the youth and enthusiasm which became irresistible in supporting the ideals of Hayden. Each had his unique order of talent, and the one supplemented the other to make a most fortunate combination.

With men of this type at the head of a movement, there could be no question of its success, even though in the beginning it was hedged about by the limitations of the period and the prejudices which were a concomitant of the mental attitude of educators toward so bold a venture as that of organizing an institution for the sole purpose of teaching the science and art of dentistry. When the faculty of the University of Maryland, on application of Harris and Hayden to establish a chair of dentistry or to make the dental school a department of the University, justified their unfavorable action by making the statement that "the subject of dentistry was of little consequence," they merely gave expression to the prevalent attitude of mind of most the educators of the times, and had it not been for the prescient vision of those two wonderful men, Harris and Hayden, dental education would have been sidetracked indefinitely.

Your honorable mayor has just raised the question with some humor as to the possible appropriateness of finding today on this site, as the logical successor to a dental college, a great financial institution, and has intimated that there might be a certain connection between this bank and the large amount of gold that is

*Delivered at Baltimore, Md., Oct. 5, 1929.

used in the practice of dentistry. I venture to call his attention to the fact that the gold used by dentists has rarely found its way into the establishment of institutions of this character. Most of it, sir, may be found reposing in the cemeteries of the land, because when gold is inserted in the human teeth in the manner taught by the founders of this college, the patients usually take those fillings to their graves. There is no kind of professional service performed for the people that carries with it the same tenure of permanence as does a dental operation well done; and without wishing to indulge in any invidious comparisons or to assume an attitude of superiority on the part of dentistry, I might be permitted, on an auspicious occasion like this, to refer to the fact that no profession brings to the people a more tangible or definite benefit than does the dental profession. We all honor medicine and law and the ministry, but it is possible to imagine an individual who is ill applying to one of our most illustrious physicians, and, on account of the intricate play of the baffling life forces, not receiving any benefit from his treatment. Men have been known to go into court under the direction of the ablest lawyer and come out worse off than they went in. And as for the ministry, who can tell with absolute certainty which one of our creeds is infallible or whether, in fact, any of them are? There is an element of uncertainty in all of these honorable callings, but no individual suffering from disease of the teeth can apply to a capable dentist without receiving at once a definite benefit. Our profession has its limitations, which we cheerfully acknowledge, but for concrete service to the people, we do not have to hang our heads when dentistry is compared with other callings.

May I call your attention at this time to the wonderful development in dental education from the day that the Baltimore College of Dental Surgery was founded till now? This institution held its first sessions in 1840-1841, in an environment that was of necessity most meager. It is recorded that all of the teaching with the exception of practical anatomy was done in one room, and that this subject was taught in a secluded stable loft. There were five students, and the first lecture was given by Harris, Nov. 3, 1840. The professors were Hayden, Harris, Bond and Baxley; all of them M.D.'s. The charter stipulated that there should be one term of four months in every year. There was a board of visitors of fifteen to supervise conditions in the institution. The first degree of D.D.S. was conferred by Hayden on two students, Robert Arthur, and R. Covington Mackall, March 9, 1841; and thereby a movement was inaugurated the future of which could not possibly have been imagined even by the men most active in it at the beginning.

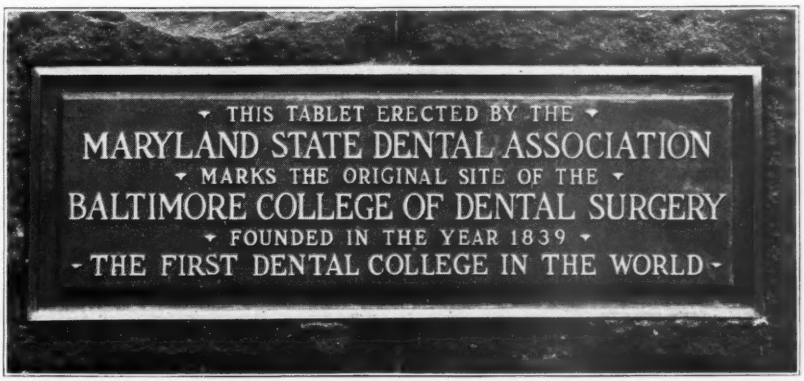
Today, with more than forty dental schools in this country alone, with a five-year course and a length of term double that of 1840-1841; with a curriculum covering a vastly greater range of subjects and an infinitely deeper detail of study in each of them, there is represented a development unparalleled in the history of professional education; and the city of Baltimore may well be proud of having been the theater where the first act of this great drama was staged.

And it is not alone in dental education that Baltimore has distinguished herself. I am informed by the worthy dean of the Baltimore College of Dental Surgery, Dr. Robinson, that the first license to practice dentistry was issued to Horace H. Hayden in 1810, and that

it was Hayden who first suggested the formation of the American Society of Dental Surgeons, years before it was actually organized, with Hayden as its first president and Harris its first secretary. Chapin A. Harris edited the first periodical published in the interest of dental science and art, and after the first issue it was published in Baltimore.

Taking this foundation of legal sanction or, in other words, of legislation, of organization, of literature and of education, we have the very warp and woof of the fabric out of which dentistry has been woven, and in view of its early history and its later achievements, we can readily claim for Baltimore the distinction of being the foremost city in the pioneer activities of our professional development. I bring to you on this occasion the felicitations of the great American Dental Association with its membership of between thirty and forty thousand, and I pledge you our best wishes for a continuance of the good work that was inaugurated on this very ground just eighty-nine years ago.

In closing, I should like to designate this as the dental Mecca toward which, in all the days to come, there may journey great numbers of our profession to pay homage to the hallowed spot where modern dentistry had its birth.


THIS TABLET ERECTED BY THE
MARYLAND STATE DENTAL ASSOCIATION
MARKS THE ORIGINAL SITE OF THE
BALTIMORE COLLEGE OF DENTAL SURGERY
FOUNDED IN THE YEAR 1839
THE FIRST DENTAL COLLEGE IN THE WORLD

Tablet marking the original site of the first dental college, founded in 1839.

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C. N. JOHNSON, Editor

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Editorials

EQUITY AMONG DENTISTS

One of the things that have the greatest influence in holding a profession together is the *esprit de corps* that develops among its members. Anything that tends to increase this is good; anything that interferes with it is bad. In order to create and maintain the proper professional spirit on the part of the members of a calling, there must be at all times an equitable dealing one with the other in every relationship in which their interests in any way come in contact.

One of the most concrete considerations in this connection arises when the regular patient of one practitioner falls temporarily into the hands of another. Because there are so many exigencies in life, this happens with increasing frequency. People travel more than they did and move about from place to place, and it is thus quite usual for them to require a minor service to the teeth when they are absent from home, and what a rare opportunity this

presents for the practitioner to whom they apply to establish between himself and the patient's regular dentist a delightful comradeship by extending to the latter the professional courtesy of taking care of the emergency of his patient without a fee or at least at a very moderate one. Of course, when this is done, emphasis should be placed on the fact that the courtesy is being extended to the patient's dentist and not to the patient. It is not well to lead a patient to believe that any dental service is not worthy of a fee, but it is well for the patient to learn that professional men find it within their prerogative and their pleasure to show a courtesy to one another through the medium of a gratuitous service to a patient. Invariably, when this attitude is taken, it not only calls forth the gratitude of the patient but it also increases his respect for dentists as a class. There is no thrill of professional life, aside from the successful accomplishment of a difficult and intricate operation, that is quite equal to that of observing the face of a patient who has received this kind of treatment at the hands of a strange dentist. Written across it is the story of a greater confidence in the essential goodness of human nature, and of increased respect for the dental profession.

But let us turn the leaves over a page or two and see what actually happens in too many cases. It is not this story that is told, but an altogether different one. Unfortunately, it is a story of exploitation of one kind or another. Instead of relieving the patient of a temporary disability in the simplest way and referring him back to the regular dentist for any extended work, the amount of the damage is magnified out of all proportion to the actual facts and there is insistence on the necessity for immediate and radical measures. If a piece is broken from a tooth or a filling has become loose, instead of making a simple temporary filling to tide the tooth over till the regular dentist can attend to it, the dentist consulted informs the patient that the tooth must be crowned at once, and forthwith it is cut off, and an expensive operation is done. Not content with this, unless the patient pointedly objects, the dentist makes an exploration of the entire mouth, and all sorts of operations are suggested. The teeth may have been giving not the least

trouble, but suddenly it is discovered that certain fillings must come out because they are "leaking," and new ones must be inserted in their stead. It matters not that the fillings to be removed have been doing acceptable service for years and that if left alone they promise as many more years to come. Numerous fillings of this type have been removed and replaced by others not nearly so good, and all to the tune of an exorbitant fee. Every bit of the sweetness of professional relationship has been taken out of the transaction, and the patient is left with the uncomfortable reflection that either the regular dentist has been remiss in his duty or that the new one has been dishonest. Toward whichever horn of the dilemma the patient may lean, there is little increased respect for the dental profession, and what might have been a beautiful demonstration of confidence and good will has been turned into a transaction of skepticism and suspicion, with a sinister aftermath to further besmirch it. The advantage to be gained by the acquisition of a few paltry dollars through methods of this sort is infinitesimal compared with the damage that is done, and no man who has any respect for the good name of dentistry will resort to such tactics.

Another instance of broken professional faith occasionally occurs when a general practitioner refers a patient to a specialist. Specialism is needed in dentistry, and its beneficence cannot be computed, but, wittingly or unwittingly, specialists are sometimes unfair to the man whose patient they are treating. If a practitioner refers a case to an exodontist for the removal of a given tooth properly identified with a diagram, the duty of the specialist ends with the extraction of that tooth, and proper subsequent care, if any is needed. He has no right whatever to point to certain other teeth in the mouth and intimate that they also should be removed. The moment he does that, he oversteps his privilege and encroaches on the rights of the man who referred the patient to him. It matters not that he may believe honestly that the teeth should come out: it is not his function to so inform the patient. The presumption of some men in this particular is past understanding, and the damage they do is hard to compute.

A typical case in point is worth recording: A practitioner referred a patient to a specialist for the extraction of a tooth. When this was removed, the exodontist remarked that there was another tooth that should be removed. When asked for the reason, he stated that it was pouring poison into the patient's system. Such a remark was absolutely unjustified for several reasons: It was not his privilege to pass on a tooth when he was not asked for his opinion. The patient was a highly nervous and apprehensive individual—imaginative in the extreme—and should never have been given such an impression. The tooth was a normal one with a living pulp, and the man was misled by a slight rarefaction at the root end in the roentgenogram due to a thickening of the membrane from traumatic occlusion. The only poison connected with the case was not around the tooth, but was that which was poured into the patient's mind by the thoughtless remark of the exodontist.

It seems inevitable that some misunderstanding may at times arise between members of the profession owing to misinterpretation on the part of patients as to what each practitioner has said, but all of this can be discounted by a candid attitude on our part toward one another and the ethical application of the golden rule in our professional intercourse. And amity and equity are so well worth while that we are making a grievous mistake when we do not cultivate them.

AGAIN THE CHRISTMAS SEALS

What a workaday world this would be if it were not for Christmas. And we need Christmas more than ever before. The intense concentration on the material interests of life, the struggle for wealth, for power, for prestige makes it particularly incumbent on us at this time to cultivate the softer graces and the sublimer sentiments of our existence. Why cannot we carry the spirit of Christmas on through the entire year? Why do we invariably revert back to sordidness and selfishness so soon after Christmas has gone?

What is there in life that is sweeter and more satisfying than the spontaneous outburst of good will and generosity at Christmas? The love we bear each other is never so apparent, never so nearly perfect as when permeated by the aroma and atmosphere of Christmas. A man who could commit a crime at Christmas time is abnormal, is pathologically constituted. It is a perversion to do wrong in the presence of Christmas, a reversal to the baser elements of our nature. At Christmas, we come nearer forgetting our meanness and rancor and hate than at any other time of the year. We long to do the splendid, brave and magnanimous thing.

And thus it is that in our profession we welcome the opportunity to help our needy fellow members at this time of the year, and fortunately a medium has been provided by our Relief Commission whereby this may be done without a burden on any one individual. The cooperation manifest by the sale of Christmas seals which are sent to our membership annually means in the aggregate the difference between want and comfort to an ever-increasing number of our unfortunate members, and when the actual work that is being done in the way of relief becomes more widely known, there will be a unanimous response on the part of our members and the speedy acquisition of a fund the interest on which will care for all those who are eligible for relief.

And this brings up a question that has sometimes been raised as to why the relief is limited to the interest on the fund, and why the fund itself cannot be dispensed for this purpose. A moment's reflection will convince anyone of the essential soundness of the decision to use only the interest, for the reason that if the principal fund were broken into, it would be only a brief period until it would be depleted to such an extent that it would yield little interest and there would be no permanent resources left. Unusual emergencies are likely to arise at any time, and there must be a sound financial policy to preserve the fund and build it up to a figure that will stand extraordinary strain.

Each year, the reaction is better to the appeal of the seals as our members become more familiar with the concrete good the fund is doing, and this Christmas we make an especial plea for a

one hundred per cent response. To any of our members who are not quite clear on every feature of this relief work, we would suggest that a letter to a member of the Relief Commission or to the Central Office of the Association, 58 East Washington Street, Chicago, will receive a prompt acknowledgment.

MODERN THERAPEUTICS AND DENTAL MEDICINE

Modern therapeutics stresses the relation between the administration of drugs of known composition and effects produced. To be worth while, the effects should be obtained under rigidly controlled conditions (as far as possible). The effects produced by drug administration must be related to main considerations, not to many uncontrolled factors of minor consideration. This is as things should be if treatment of disease is to be progressive. It is generally appreciated that many factors enter into a consideration of the treatment of a diseased condition. Some of these, especially in the organism, are frankly beyond control. But the alert practitioner appreciates that the greater the number of factors under control, the more scientific and rational does medication become. It is an appreciation of this point of view that raises therapeutics from an art to a science, and to this point of view, much of the therapeutic progress of recent years can be traced.

Nowhere can a better start in the elimination of unknown factors be made than in the quality and quantity of drugs administered, for either systemic or topical application. It is this emphasis of modern therapeutics which has guided the A. D. A. Bureau of Chemistry in its published expressions. For this reason, the Bureau has emphasized repeatedly the desirability of using only drugs of known composition and of proven therapeutic usefulness in the treatment of dental diseases. By so doing, it is readily possible for the individual practitioner to compare his own clinical results with results obtained by many other practitioners. These results may be found as a rule in reputable journals. This is an impossibility when secret remedies are used. Unless this ele-

mental rule is followed, confusion is added to the picture. Consequently, not only does the user of secret remedies hinder his own development in this difficult field, but such practices also retard the forward development of the science and practice of dentistry as a whole.

This is but one of the problems facing the profession. There is still another angle, no less important, of which the scientific dentist is aware. The composition of secret and scientifically unacceptable preparations is apt to be an ever-changing affair, and the stated composition is apt to be a clear misstatement of facts. With the former, the composition often changes with little or no notice served to the profession which is asked to use them. Such a change of composition very often follows an exposé, or even changes at the whim of the purveyor. In some cases, when a statement of composition appears, it is frankly a misstatement of fact. Recently, a number of such cases have come to the attention of the Bureau. In particular, one preparation (of a shotgun type) was exploited to the profession under a fanciful name and high sounding claims for the treatment of pyorrhea. The purported composition claimed the presence of a number of ingredients, among them potassium permanganate and copper sulphate. When the preparation was analyzed by government chemists, neither of these ingredients could be found. To list other examples of such abuses of the confidence of the profession would require more space than is available. But this example may suffice to illustrate the destructive tendencies which hinder the scientific development of rational and scientific dental medication. Any "clinical" evidence such as was presented for this product probably could not be duplicated if the printed formula of the preparation were followed.

As far as rational therapy is concerned, the untenability of this situation is readily apparent. Here lies just one danger in prescribing trade names instead of known drugs. When one uses and prescribes known drugs of proven merit, one knows "what's what" to begin with. But with secret remedies one can never be absolutely sure that the same drug or mixture thereof is being used at successive periods. The remedy for this is a critical examina-

tion of the chemical composition and therapeutic claims of every drug or drug mixture the dentist is importuned to use.

As far as the profession insists on its due, so far will its rights be respected. We repeat: It is not only the duty but also the right of every practitioner to know what he uses and prescribes. By following this fundamental rule of rational therapeutics, dental medicine will follow in its proper path the scientific and rational medication of dental abnormalities.

MOVE OVER

Always remember that there is room enough for all, and the more room you make for others, the more you have for yourself. To keep more space than you can profitably occupy is not only an expression of selfishness, but is also likely to bring down on you the reputation of simulating a well-known quadruped with an undesirable name and reputation. Move over, and let some one else sit down. You had better be squeezed a little than to be called a hog. No one ever yet sat comfortably who kept some one else standing needlessly. It contributes to warmth of body and heart to move over and let some one sit beside you—it is chilly sitting alone.

Selfishness never brought real satisfaction to any one, never forced a glow of happiness in the heart, never made a man sleep sounder at night. Selfishness is the sign of a small soul, the badge of narrowness and meanness. It also tells the story of ill breeding—a really well-bred individual will never be selfish. *Noblesse oblige* is as full of significance as it ever was, and as free from selfishness. No real gentleman will ever lack in consideration of others. You cannot afford to display a churlish spirit and occupy more space than belongs to you—move over.

BUREAU OF CHEMISTRY

THE TRUTH ABOUT SOME PATENT MEDICINES

THE patent medicine and proprietary evil that faces the public and the medical and dental professions is a matter of deep concern to those interested in guarding the public health. Fortunately for the citizenry of this country, there are numerous agencies, both of a public and of a semipublic character, that maintain a constant vigilance against those who would exploit the public for pecuniary gain. The exposès from the A. D. A. Bureau of Chemistry which have appeared in these columns during the past year serve in a small measure to illustrate what is being foisted on the public and the profession by unscrupulous persons. The work of the Bureau is only a small part of the work done in the interests of public health by such organizations as the U. S. Department of Agriculture, State Food and Drug Laboratories, the Post Office Department and the American Medical Association, through its Council on Pharmacy and Chemistry and its Bureau of Investigation. In order that the members of the dental profession may become better acquainted with the various frauds and dishonest and unworthy medical remedies foisted on the public, this department will print at intervals abstracts of Notices of Judgments and Fraud Orders issued at the behest of the U. S. Department of Agriculture and the U. S. Post Office Department, and abstracts of articles by the American Medical Association.

THE TRICHO SYSTEM

According to the advertising booklet distributed by "beauty parlors": "Tricho System is the invention of Albert C. Geyser, M.D., a New York physician internationally famous as a specialist on Electro-Therapy." Dr. Geyser claims to have so modified the x-rays that with his apparatus it is possible to produce permanent baldness in hairy areas without any possibility of doing damage to the skin. It is not necessary to tell physicians—at least, those with any extensive dermatologic experience—how serious a menace is the use of x-rays in the removal of superfluous hair. The tragedy in the case arises from the fact that the precancerous keratoses and other untoward effects are usually not evident for months after the "treatment" has been given. Further, the victims—nearly always women—frequently refuse to prosecute, because of the inevitable publicity. A few dermatologists have, however, reported cases of the disfiguring and dangerous sequelae that have followed the use of the Tricho System. (*J.A.M.A.*, Jan. 19, 1929, p. 252.)

LESSER SLIM FIGURE BATH

During the past few months there has been put on the market a preparation sold under the name of "Lesser Slim Figure Bath" which is described as "The Sensation of Europe" that, by its "mysterious action," will reduce the weight of the fat "regardless of your diet." It comes from Berlin—if one is to believe the advertising—and is the invention of Herr Felix Lesser, who, it is claimed, submitted "his remarkable discovery" to "the eminent Dr. G. Braun of Berlin." The eminent doctor's report is part of the Lesser Slim Figure Bath advertising. An American company has been formed—The Lesser Co., incorporated under the laws of Illinois. The Chicago *Tribune* has advertised the preparation although its health editor informed a

correspondent that he knew of no substance used in baths which will reduce weight. The Lesser Slim Figure Bath comes in the form of a package of white, highly scented effervescing powder in which there is a large compressed tablet that also effervesces. The instructions are to fill the bath tub with hot water, empty the contents of the package into the tub and stir well, get into the tub and place the tablet "under your back." From its analysis the A. M. A. Chemical Laboratory concludes that a product having essentially the same properties as the bath powder may be prepared by using: corn starch, 7 parts; borax 1 part; baking soda, 1 part; tartaric acid, 1 part; strongly odoriferous perfume. The Laboratory found from its analysis that a tablet having essentially the same composition as that of the Lesser tablet may be prepared by using: baking soda, 1 part; table salt, 6 parts; tartaric acid, 3 parts; talc, as binder. Every physician knows that this absurd mixture cannot have the slightest effect in the reduction of weight. (*J.A.M.A.*, Feb. 9, 1929, p. 492.)

THE MARMOLA QUACKERY

Edward D. Hayes has been quacking it for a quarter of a century. Using the trade name "Marmola Company" he exploited a thyroid-containing mixture—Marmola. In 1926 the postal authorities were about to issue a fraud order against the Marmola Company when Hayes submitted an affidavit declaring that he would discontinue the Marmola business. He did so by changing the name of the Marmola Company to the Raladam Company! He continued to sell his nostrum through the drug stores instead of through the mails. Now the Federal Trade Commission has issued an "Order to Cease and Desist," the essential features of which are that the firm cease and desist from representing that Marmola is a scientific and accurate method for treating obesity; representing that the formula from which Marmola is made is a scientific formula; and representing that Marmola can be taken without the advice and direction of a competent medical authority as a safe and harmless remedy in the treatment of obesity. (*J.A.M.A.*, May 4, 1929, p. 1541.)

FAYRO

Another Quack Obesity Cure of the Bath Salt Type. It is learned that the Federal Trade Commission has issued a complaint against the Fayro Laboratories, Inc., a Delaware corporation, doing business from Pittsburgh, and engaged in the manufacture, advertising and selling of an alleged cure for obesity. The advertising of the firm asserts that weight reduction may be secured by means of baths. The Federal Trade Commission in its complaint sets out eighteen indictments against this humbug, each one answering claims that are, or have been, made for Fayro. The last sums up the case against this mixture of epsom and common salt thus: 18. Fayro is an unsafe, unscientific, ineffective and independable nostrum and will not remove fat or flesh from the human body. (*J.A.M.A.*, June 22, 1929, p. 2121.)

REDUC-IT

A Nostrum for Reducing High Blood Pressure. The Denver Research Laboratory of Denver, Col., put out a preparation which, it was claimed, would reduce high blood pressure. It was called "Reduc-it." It was claimed that the preparation would "Prevent apoplexy, paralysis, Bright's disease, rheumatism, eczema, boils, pimples and many other diseases caused from high blood pressure and impure blood." The postoffice authorities have issued a fraud order excluding the Denver Research Laboratory from the use of the mails. The "Denver Research Laboratory" was not a laboratory at all. It was a trade name adopted by one Gilliard W. John, who conducted the business from a "one-room-and-bath apartment" occupied by himself and his wife. The preparation, Reduc-it, was made up of equal parts of cream of tartar, epsom salt and magnesium carbonate. (*J.A.M.A.*, March 2, 1929, p. 743.)

ERCOLIN

Another "Cold" and Hay Fever "Cure." The Smith-Ernster Laboratories, Inc., of New York City exploit a "patent medicine" known as "Ercolin." Ercolin is said to be the "result of six years of intensive research" made by Dr. Nicolas Ernster. Ercolin is described as an "entirely new physiological compound," which "reacts on the protein of the pollen, thereby neutralizing the effect of ALL pollens." From the examination made in the A. M. A. Chemical Laboratory we learn that this "marvelous remedy," perfected by the "eminent Boston scientist," Nicolas Ernster, Ph.D., as the result "of years of effort," is nothing more wonderful than a weak solution of gallic acid in dilute glycerine! (*J.A.M.A.*, Feb. 23, 1929, p. 670.)

BUREAU OF DENTAL HEALTH EDUCATION

DENTAL SERVICE IN HOSPITALS—ITS PROBLEMS AND THEIR SOLUTION*

By SIGMUND W. A. FRANKEN, D.D.S.,† New York City

DENTAL problems in hospitals divide themselves into two classes: general problems, which hold good for all hospitals, and specific problems, which arise in each individual institution.

It will clarify a discussion of these problems to refer to a plan described in *The Journal of the American Medical Association*[1] which deals with the organization of a dental department for ward services in any general hospital. This plan, called "The Lenox Hill Hospital Plan for Dental Service" is a flexible one, easily adaptable to the size and resources of any institution.

Of primal importance is the proper organization of the staff, which should consist, at a minimum, of an experienced dentist, a dental intern and, if possible, a dental hygienist. The dental intern should take care of the average ward work, and the hygienist, in addition to oral prophylaxis, should assist in examining and charting the patients. But it is the attending dentist, and no one else, who is directly responsible for the running of the entire department. With this basic interstaff relationship firmly established, it is an automatic procedure to increase the number of interns, hygienists and associate dentists in proportion to the increase in work.

So much for a brief outline of staff. Now a far more difficult problem confronts us in the successful functioning and adjustment of what is comparatively a new and alien department in hospital routine. Since our own standards in hospital work are in the making, it will facilitate this achievement to use the standards of physicians and surgeons and to place ourselves as far as possible upon an equality basis with them. The attending dentist, therefore, must have the same ideals, ambitions and capabilities as the corresponding leaders in the various departments throughout the institution. This presupposes immediately that the man in charge of the dental division must be one who, like his medical colleague, has had experience in ward work or an outpatient department. He must also, according to the same standard, be prepared to give two or three half days a week to the hospital, as well as holding himself in readiness for emergencies or necessary consultations.

*From the Dental Service of the Lenox Hill Hospital.

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Seventy-First Annual Session of the American Dental Association, Washington, D. C., Oct. 9, 1929.

1. Franken, S. W. A.: Lenox Hill Hospital Plan for Dental Care of Hospital Patients, J. A. M. A., 83:1866-1868 (Dec. 6,) 1924.

On analyzing several institutions where dental departments have not been successful, it is interesting to note that, in almost every instance, the attending dentist or dentists were content to shift their responsibilities to the interns, while their own sessions at the hospital were, after the first few months, sporadic and perfunctory. The outcome of this type of service is self-evident.

Before leaving the qualifications of the attending dentist, it might not be amiss to state that, contrary to the prevailing opinion, it is not necessary to have an oral surgeon head the department. Indeed, on investigation, it was found that one hospital had an orthodontist, another an oral surgeon and a third a general practitioner. In short, it is the individual and not his specialty that is the important point.

Let us now take up the problem of the intern. Medical intern applicants receive an oral examination after previously filing preliminary application blanks and presenting letters of recommendation, after which the executive medical committee makes its selection. The board of trustees then does the final appointing. This method should be followed in selecting the dental intern. The dentist in charge should have all applicants appear an hour or two before the meeting of the executive committee. This is to avoid a waste of time for the applicants, who otherwise would have to appear twice. The attending dentist should orally examine those presenting themselves, and select three for each vacancy. Those chosen must not necessarily be the best scholastically, but should have good general intelligence and an ability to orient themselves to institutional conditions.

Having sifted his applicants, the dentist in charge introduces the three men for each vacancy to the appointing committee of the hospital, and to the superintendent. The chairman asks a few leading questions of each man as he is introduced. After this has been done, the applicants are told that they will hear the decision within a few days. After they are dismissed, the committee discusses the applicants and selects one of the three, not solely from a dental standpoint, but from a personality one as well, and recommends him to the trustees, who, in turn, appoint him. By this means, several things are accomplished:

1. Equality of appointment of dental and medical interns has been established.

2. No one is error perfect. If, during his internship, the young dentist should behave himself in a manner unbecoming to a gentleman, the executive committee naturally shares the responsibility with the attending dentist.

3. It brings the executive committee in touch with the dental department, and many valuable suggestions have thus been received by the dental department.

Dental interns should be of the current graduating class, which usually means that their ages are from 21 to 24. No married medical interns are accepted, and the same rule applies to the dental interns.

Before continuing, it might be advisable to touch on the compensation of a dental intern. This should be equal to that of the medical intern. In most hospitals, the medical intern gives his time and is repaid by experience.

The next problem is the selection of the dental hygienist, provided the hospital has appropriated funds for her employment. She should be selected as are any of the graduate nurses of the hospital: on a basis of her character, references, professional aptitude and ability to fit into the routine of the institution.

Now that the staff has been discussed, some of the more specific problems can be considered.

Possibly the one question most frequently asked concerns the taking of roentgenograms. None of the other specialties in a hospital are expected to make their film exposures, and just why the dental department should be singled out for differentiation has never been clear. The moment the dental department takes its own films, an inequality is established which will inevitably lead to further differentiations; therefore, the department taking the films for the entire hospital should also take them for the dental department. If there is a special dental x-ray machine, the roentgenologic department should supply the technician, who, when properly trained and under the jurisdiction of the roentgenologist, is better than an ever-changing dental intern. Besides, if the dental intern makes the exposures for the ward patients, who then would be expected to do this work for private patients or dental patients of the outpatient department?

The interpretation of the dental films is another question. Few physicians are proficient in this, and as the number of dental films taken in a general hospital is apt to be large, for speed and accuracy in interpretation a good method is to have an experienced dental roentgenologist on the dental staff. His duties should be to interpret the dental films of all patients, private as well as outpatient department and ward. To do this properly, he must arrange to work every other day for approximately one-half to one hour. Films should be ready for interpretation when he arrives, and a secretary from the roentgenologic department should be present to take his dictation.

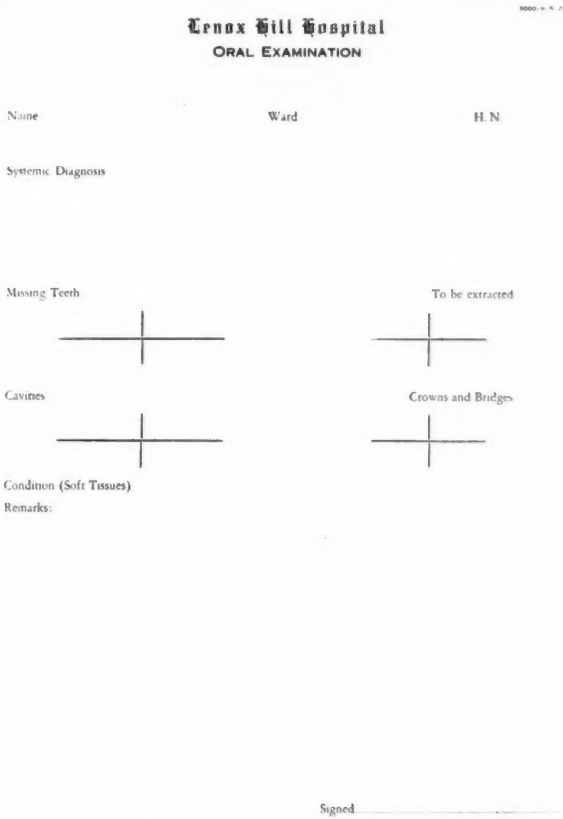
Next, the question of a separate dental ward in a hospital is often discussed. In every well-run institution, each patient receives a physical examination and has routine laboratory tests made soon after admission. The reason for this is obvious, and needs no further discussion. Ideally, this procedure should be followed for all purely dental hospital patients; but are dentists qualified by training or experience to do this? You know the answer: as a class they are not. Furthermore, besides the intern, a member of the attending staff must look after the patients daily; and very few dentists would be able or willing to go daily to the hospital.

There are two answers to this problem of the establishment of a separate dental ward. One is the method employed thus far at the Lenox Hill Hospital. The dental department has at its service about five beds. These are scattered over the various wards: surgical, medical and children's. For example, a patient needing a third molar removed is, when hospitalization is advisable, admitted, preferably to one of the surgical wards. If no bed is available, he is placed in the medical ward. In either event, he receives the routine physical and laboratory examinations from the medical intern. The use of a mouth wash, compress or whatever dental care is necessary is looked after by the dental intern. When all reports are satisfactory and the choice of anesthesia has been made by the attending dentist (aided by consultation with the physician), the patient is operated on. The operation is performed by some one in the dental department. A strict rule of all hospitals is that no medical intern may operate without the presence of a member of the attending staff, and, referring again to the equality basis, the same rule should hold for the dental department. Occasionally, a patient with an adenitis due to a suppurating tooth merely requires the extrac-

tion of a loose first permanent molar. When it is impossible for the attending dentist to be present, one of the adjuncts of the surgical staff should be in the room, the rule of the hospital being thereby followed. Incidentally, it becomes impressed on the physician that every swelling of the face due to an abscess need not necessarily call for lancing externally. This method of handling the patient again acts as a welding influence on the two departments.

The plan of having separate wards for the purely dental conditions may be solved in another manner. If the medical intern assigned to the specialty service, such as nose and throat, is made responsible for the physical and laboratory examinations of the dental patients, then, and only then, should the dental department assume a separate service.

Every hospital has a large percentage of patients requiring prophylaxis, emergency treatments and extractions. How,



Lenox Hill Hospital

ORAL EXAMINATION

Name Ward H. N.

Systemic Diagnosis

Missing Teeth

To be extracted

Cavities

Crowns and Bridges

Condition (Soft Tissues)

Remarks:

Signed

Oral examination chart used at Lenox Hill Hospital.

when and by whom these shall be treated is the next problem.

A good rule, and one that should be constantly checked by the dental director, is to have every patient in the hospital receive a dental examination, within twenty-four hours after admission. The dental findings should be recorded on a simple chart, the paper of which should be a distinctive color, and signed by the dental intern. This chart should be part and parcel of the general history. The distinctive color used by the Lenox Hospital is a light green. The purpose of this is to make the dental findings readily discernible to the attending physicians or surgeons. All ambulatory patients in a nonfebrile state should receive prophylactic care, but the necessary extractions should be done only with the knowledge and consent of the medical or surgical staff.

The green chart, besides having the name, ward, history number and systemic disease, carries the following dental findings: teeth to be extracted; teeth to be filled; teeth carrying crowns and bridges; condition of soft parts, and remarks as to abnormal findings.

The symbols used in charting are the numbers 1 to 8 for each quarter of the jaw, a horizontal line indicating upper and lower, and a vertical line bisecting the horizontal denoting median line, the mouth being thus divided into four quarters.

To point out still another reason for not having the chart white: It will be remembered that, besides the usual white paper and charts on every hospital patient's history, there are also several colored sheets—pink ones for bedside notes, brown ones for laboratory findings, etc. Following out the equality theory, the differentiation of color in the dental sheets, though a very small matter, nevertheless serves to again classify the dentist as a part of the general working staff of the institution.

Cooperation between dentist and physician is one of the largest problems, but it can be brought to a high plane in a general hospital. To this end, the dentist should take the initiative. For example, when he receives a request from a physician for a consultation, he should see the patient the same day and report his opinion, not to some medical intern, but on the general history chart on the sheet designated for bedside notes. The dental intern should take down what is dictated by the attending dentist, and the opinion should be expressed in clear, concise language. Involved sentences with many highly specialized dental terms should be avoided in favor of simple expressions common to both professions. We should endeavor to learn the physician's language; later, he will learn ours. In the meantime, use his words whenever possible in order to establish a better understanding between us.

The entire problem of cooperation is not so simply solved. Often the surgical service requests extractions at the same time that an epithelioma of the mouth is being removed. In such an instance, the dental department should have a representative ready to do and capable of doing the work. This leads to another point that is at times most awkward, namely, the proper technic to be employed for preparing oneself to operate in the modern surgical room of a hospital. Most dental interns and dentists are sadly remiss, not only in the knowledge and significance of scrubbing and sterilizing their hands, but even in the donning of sterile gowns and gloves. This is not the time to describe these proceedings: I wish merely to strongly urge all dentists who are affiliated in any capacity with a

hospital to become familiar with the principles of operating room behavior. Indeed, it is not only in the operating room that the young intern will find himself at loss. He probably will not know the method of making cultures. Ignorance is no crime, but continued ignorance is unforgivable. Therefore, he should either be taught by the attending dentist or sent to the pathologic laboratory to ask questions and learn. I have yet to find a physician or laboratory worker who did not take the time to answer a reasonable question.

It is not necessary to point out further illustrations of cooperation. If it be borne in mind that cooperation means not talk, but actual work and a reciprocal process, it will be found to work naturally.

This problem of teaching the dental intern is next in importance, and still again the quality method solves it. How do the medical interns receive their training? By continual repetition—making the rounds of wards, attending the various medical and surgical conferences and being present at necropsies. And, naturally, they assist in the operating rooms and laboratories.

The dental intern should follow the same method. He need not attend every conference, or there would not be time for dental work. A good way to acquire a general medical and surgical understanding has been outlined elsewhere,[2] but a résumé would do no harm. Having gained sufficient dental experience in college and the outpatient department, the young denist should begin his official internship with weekly attendance at rounds with the medical staff. The monthly medical and surgical meetings should find him present. Whenever possible, he should attend necropsies. He should also attend clinical society meetings at the hospital. In addition, he should always assist the attending dentist, or whoever has charge of the oral surgery. And last, but far from least, as much time as possible should be spent in the general surgical operating room to observe the fundamental laws of surgery. Then, at the end of his service, the dental intern will know that the mouth is but a part of the human body which responds to the general laws of physiology, surgery and pathology.

Much time could be spent in discussing the various branches of dentistry practiced in general hospitals. Briefly, a résumé of more than 330 answers to questionnaires sent to hospitals throughout the United States, Canada and the Philippines[3] disclosed the fact that minor oral surgery, including extractions, is practiced universally in the hospitals, while the other phases of dental work depend a great deal on the financial condition of the institution, as well as on the specialty of the director of the dental department.

At the Lenox Hill Hospital, the problem has been handled in a fashion which I believe is readily applicable to any general hospital. Briefly, we undertake no work that cannot be accomplished within the period that the patient is to remain in the hospital. We do not undertake to make prosthetic appliances (except fracture splints), and we do only root canal work that occasionally must be done in preparation for root resection. Orthodontia, for the reason above stated, is also eliminated from the régime. Discrimination against these branches of

2. Franken, S. W. A.: Dental Care of Hospital In-Patients—Lenox Hill Hospital Plan, Dent. Cosmos, 67:603-606 (June) 1925.

3. Franken, S. W. A.: Dental Internships in General Hospitals of United States, Canada and Philippines, J. A. D. A., 15:768-776 (April) 1928.

dentistry is well advised. Reverting to the original equality basis: after an amputation or abdominal operation, the surgical department is not expected to provide an artificial limb or truss; therefore, the dental department in a general hospital should not be asked to restore missing teeth. Furthermore, the hospital is thus saved from not infrequent abuse by the patient. For example, a restored tooth may be too long, too short or what not, with the attending possibility of a lawsuit fomented by an idle lawyer. And, very often, there would be demands for free repairs on work done several years previously. Perhaps, before closing the subject, it would not be amiss to mention the work that we do engage in. We are well equipped for extractions, oral surgery, prophylaxis, pyorrhea (to a limited extent), palliative fillings and some cement and amalgam fillings.

The outpatient department is another matter. In general, we follow the same rules as to the branches of dentistry performed. For a description of the outpatient department, a separate paper would be required, and it is therefore left out of the present discussion.

SUMMARY

To recapitulate: In dental service in a general hospital, the following should be remembered:

1. As stated so ably by Brown[4]: "The dental section . . . neither to be apart from nor exist separately from other medical activities." In other words, it should be on an equality basis with the other specialties.

2. There should be proper staff organization and selection, and the establishment of a regular routine.

3. Dental roentgenograms should be taken in the roentgenogram department or by a technician from that department; and should be interpreted by a competent dentist.

4. There should be a separate, distinctive and simple dental sheet properly entered with every patient's history.

5. There should be constant cooperation with all the various departments of the hospital.

6. Dental work should be of a nature that it can be finished within the time the patient remains in the hospital.

7. Perhaps most important of all, the dental director should be selected entirely on his previous experience in hospital work. This cannot be stressed sufficiently. Many institutions have dispensed with the dental department, not because of a lack of need, but because of the negligence or inability of the man appointed as director. Therefore, all fraternal, political and social considerations should be ignored, ability and experience in hospital work being the only basis of selecting the head of the department.

4. Brown, J. L.: U. S. Nav. M. B., 25, No. 2.

26 East 36th Street.

ORAL HYGIENE IN INDUSTRY*

By E. C. Despotes, D.D.S., Chicago, Ill.

IT IS a well known fact that pathologic changes in the tissues of the mouth occur in a number of occupational intoxications, and that these symptoms serve in a number of cases for the proper diagnosis of the particular affection of the patient. On the other hand, the introduction of industrial dentistry in many industrial and commercial enterprises has proved to be a factor in saving, as well as an important part of social service, and its adoption has more than justified the expense involved. It follows, therefore, that there are two distinct fields of service in the practice of oral hygiene in industry, the first of which considers the occupational diseases of the mouth, their meaning in the general health of the individual, their pathology, prognosis and treatment; while the second confines itself to the treatment of the pathologic conditions of the teeth and their surrounding tissues. Naturally, the discussion of "Oral Hygiene in Industry" in this paper will be divided into two parts: (1) the occupational diseases of the mouth and (2) industrial dentistry.

OCCUPATIONAL DISEASES OF THE MOUTH

The affections of the mouth develop mostly in workmen exposed to the vapors of acids and to the fumes of metals and chemicals, and to a very little extent they are due to the type of occupation.

Deleterious effects have been observed in the mouths of workmen exposed to the vapors of sulphuric, nitric, hydrochloric and hydrofluoric acids.

Sulphuric Acid.—In the manufacture of sulphates in England, as it has been observed that workers employed for seven years and exposed during that time to the vapors of sulphuric acids have lost all of the teeth.[1] In the extraction of sulphur dioxid for the manufacture of sulphuric acid, the fumes of sulphur dioxid in the proportion of 0.03 to 0.04 per thousand in the air are very irritating and may produce caustic effects on the mucous membranes of the mouth and the upper air passages, and have been known to produce spasm of the glottis.[2]

Hydrochloric Acid.—The fumes of hydrochloric acid are also very irritating, and, in a concentrated form, they have produced caustic effects on the tip and edges of the tongue, erosion of the teeth and ulceration of the nasal wall.[3] In Switzerland, it has been observed that the teeth of workers exposed to liberated hydrochloric acid and to vapors of nitric acid lose their luster and become brittle and sensitive to thermal changes and to weak acids liberated in the process of

*From the Department of Hygiene and Bacteriology, the University of Chicago.

1. Moorehead, F. B., and Dewey, Kaethe W., Pathology of the Mouth, Philadelphia: W. B. Saunders Co., 1925, p. 264.

2. Kober, G. M., and Hanson, W. C.: Diseases of Occupation and Vocational Hygiene, Philadelphia: P. Blakiston's Son & Co., 1916, p. 536.

3. Footnote 2, p. 537.

mastication, with the result that their mastication is greatly interfered with.[4]

Nitrogenous Compounds. — In the manufacture of nitroglycerin and nitrocellulose, it has been observed that the teeth of the workmen, chiefly the incisors and cuspids, become yellowish, dull, rough and brittle. Their cutting edges become smaller and their corners wear off. The teeth become smaller and peg-shaped, with spaces between them, and, where they wear off to the gingival margin, proliferating tissue grows over the stumps. The destructive process starts outside and grows in, producing a slant surface of the crown.[4] The inhalation of nitrous gases produces, among other serious symptoms, injury to the teeth.[5]

Prevention consists in the use of enclosed processes and proper supervision, so that there may be no leakage of gases. Good overhead ventilation should be used where acid fumes are present in considerable strength. The periodic general examination should include a thorough oral examination, and if any deleterious effects are observed, they should be properly treated before they reach the advanced stage. In general, it is important that the mouth and the teeth be kept scrupulously clean at all times, and periodic dental prophylactic care is to be highly recommended.

Occupational diseases of the mouth due to phosphorus, mesothorium, mercury, lead, zinc, and copper and their chemical compounds may be outlined as follows:

Phosphorus. — Of all the industrial poisonings, the most dreaded one is the so-called phosphorus necrosis or "phossy jaw." It is a chronic local disease, affecting the bones of the face, and especially those of the jaws. It usually starts in a carious tooth or a root exposed by receding gums, a gingival pocket or a recent wound due to extraction, and rapidly evolves into a periostitis of the alveolar process of that particular maxillary bone. It results in the formation of abscesses, sloughing of the periosteum and necrosis of the denuded bone; periostitis, periodontitis, pain, swelling, loosening of teeth, recession of the gums, suppuration with a fetid odor, ankylosis of the temporomandibular joint and exposure of the bone surface, which becomes rough. All these preliminary symptoms lead to necrosis and destruction of the bone, "which comes away from the upper jaw in fragments, while in the lower jaw a sequestrum forms which is held fast by the callus and is not spontaneously cast off."[6] The pus is produced by the ready entrance of infecting microorganisms, due to the loss of resistance to infection by the periosteum. It produces excruciating pain, while it is enclosed in the abscessed bone, but when a fistulous opening is formed, it is very slow to heal and the discharge of the pus continues for long periods of time. If the upper maxillary bone is affected, ulceration of the lining of the nose may take place, and even perforation of the septum.

If the necrosis is not very far advanced, healing may take place in a year or two. In the lower jaw, some new bone may be formed, but in general the loss of several teeth and a part of the alveolar process cannot be avoided. In severe cases, the whole affected bone is lost, or both the upper and the lower jaws must be removed; or even the bones of the face and the cranium may become suppurated, with destruction of the eye, or an extension to the meninges may even take place, when death occurs early. Later, death

4. Footnote 1, p. 265.
5. Footnote 2, p. 734.
6. Footnote 5, p. 147.

may occur from chronic sepsis or tuberculosis. The death rate is about 20 per cent. When recovery takes place, terribly disfiguring deformities remain.

Individual susceptibility plays a great rôle in the poisoning. Only a small percentage of those exposed, even of those with carious teeth, develop necrosis. Phosphorus has a specific action on the bony system in general, setting up changes in the periosteum of other bones (besides those of the jaw) and lowering their resistance to infection. Necrosis follows the infection by pus-producing bacteria.

This disease occurs mostly among workmen of match factories, but after an international agreement, entered into in 1906, the use of poisonous phosphorus (white or yellow) was prohibited. The United States has imposed a prohibitive tax on these matches. A new product, "sequisulphid of phosphorus," has been developed in France, and it has been used since then in the manufacture of safety matches. Other industries in which phosphorus poisoning may occur are the manufacture of fireworks, and the production and handling of ferosilicon.

The treatment may be either early and radical or expectant and conservative. All carious teeth should be extracted and the wound properly curetted until complete healing takes place. (Some prefer to leave those teeth which show little decay). Abscesses should be incised, cleaned and drained, and, if necrosis of the bone is present, immediate subperiosteal resection through healthy bone is advised. Those following the expectant treatment wait until a sequestrum is formed before resecting the necrosed bone. They claim that a small portion of the bone has to be removed then, but if the danger of sepsis is great, an early extensive operation is necessary.[7]

Mesothorium.—In radium painting of luminous watches, etc., mesothorium acts in the same way as phosphorus, producign necrosis of the jaw. The poisoning takes place either through inhalation or through the use of a camel's hair brush, which is held by the lips in the intervals between painting.[8]

Mercury.—In mining and smelting of mercury, in metallic mercury industries, in industries producing chemical mercury preparations and in felt hat manufacturing, chronic mercury poisoning may occur among the workmen, this depending on their susceptibility. Women, young persons and weakly individuals are most disposed to it. Exposure to vapors of mercury, skin exposures of dust of mercury and lack of cleanliness in handling it, or mercurial treatment of syphilis will produce the disease. Inhalation of dust of mercury causes, among other severe systemic symptoms, inflammation of the gums resembling the pyorrheic conditions and inflammation of the mucous membrane of the mouth. There are three types of stomatitis: 1. Simple stomatitis, in which there is a metallic taste in the mouth; the teeth become blunt; the gums become bluish and congested, very sensitive, bleed easily and recede; salivation occurs, and the breath becomes fetid. 2. Ulcerative stomatitis, in which there are flat erosions and ulcerations (yellow), with well-defined, thickened borders covered with a gray and yellowish coating and surrounded by a zone of inflamed tissue. These ulcers are present on the tongue, the gingiva and the mucous membrane of the mouth and the lips. The

7. Footnote 5, p. 145-151.

8. Shaughnessy, H. J.: Lecture on Radium Painting, in the Industrial Hygiene Course, University of Chicago, 1929.

teeth are painful and loose. 3. Gangrenous stomatitis, in which there is extensive ulceration and swelling of the lymphatic glands, alveolar abscesses, periostitis, necrosis of the jaw bone and general septicemia. The presence of thin pus manifests itself in both the ulcerative and the gangrenous types of stomatitis.

In corrosive sublimate poisoning, there is brittleness, with destruction of the teeth and gray or black discoloration of the teeth or artificial dentures, due to the metallic dust of mercury forming amorphorus black mercuric sulphid.[9] When corrosive sublimate is taken, instant pain and burning in the mouth occur as a result of the corrosive action of the substance. If it is absorbed through other channels (uterus or bladder), symptoms in the oral cavity are absent for the most part.[10]

Lead.—The only symptom of lead poisoning of the chronic type in the mouth is the formation of a line on the gingivae, which is slate-gray, and is due to lead sulphid (PbS) formed by the decomposition of food particles.[11] In people with clean habits, it may be altogether absent.

Zinc.—Among the other symptoms of acute zinc poisoning, there is a metallic taste in the mouth, a bluish line appears on the gingiva, congestion and suppuration of the gingival tissue take place, the teeth become loose and fall out, a little pain is experienced, the jaw bones become involved and the glands inflamed.[12]

Copper.—In acute copper poisoning, there is a bluish green line present on the gingiva and discoloration of the teeth, which remains even after good care has been taken of the teeth.

9. Footnote 1, p. 266.
10. Footnote 1, p. 127.
11. Footnote 1, p. 265.
12. Footnote 1, p. 267.

Mechanical Injuries. — Smokers of pipes show coronal defects of the incisors and the cuspids and involvement of the soft tissues. Dressmakers show defects of the incisors due to cutting thread by these teeth, and shoemakers and carpenters show similar defects from holding nails between these teeth. Players of instruments (clarinet) show lesions of the upper incisors and thickening of the mucous membrane of the lower lips. Glassblowers develop flabby and stretched cheeks and flabby mucous membranes, and whitish gray spots and patches of various sizes appear. In overstretching, minute lesions of the mucous membrane appear, due to the proliferation of tissue following constant irritation, and the proliferated tissue becomes macerated and desquamated. Air tumors of the parotid gland have been observed in from 6 to 10 per cent of the workmen, due to air held in Steno's duct. These tumors may be removed by compression.[13]

INDUSTRIAL DENTISTRY

Industrial dental service began in the United States during the early part of the World War. Previous to that time, the mouth hygiene movement reached the factory worker through the bulletin service of the National Safety Council. The industrial dental clinic came into existence as an offspring of the industrial medical clinic. The first one was established in 1911, in the plant of the Armstrong Cork Company; and there are today more than 400 dental clinics in industry.[14]

In addition to the manufacturing plants, a number of large commercial establishments, especially in the East, have established dental clinics for the benefit

13. Footnote 2, p. 638.
14. Smith, A. W.: Industrial Dental Dispensaries, Dent. Cosmos, 62:1097 (Sept.) 1920.

of their employes. It has been found that having a dental clinic in a large department store is quite a saving, because the store without a dental clinic usually allows a worker to go to a dentist on store time, and a visit to a dentist for one hour's work usually results in the loss of a whole morning or afternoon. The same principle holds true for the industrial dental clinic. Furthermore, an employe who is distracted because of a toothache will not be efficient in his work.

The third class of community dental clinics are those which are supported by the mutual aid associations formed by the employes themselves. A good example of this type of a dental clinic is that of the International Ladies' Garment Workers' Union, which established the Union Health Center dental clinic in 1917 with only three dental outfits. In 1924, this clinic had grown to twenty-four dental outfits. Only members and their families are accepted for treatment at this clinic, and all types of dental service are offered at cost, about $4 an hour.[15]

Services rendered in the industrial and store dental clinics may include all types of dental work. Most establishments limit the dental service to examinations, prophylactic treatments and the insertion of temporary fillings. This service is offered to the employes at cost, and in very rare instances, it is offered free of charge. The dental clinic of the Metropolitan Life Insurance Company, for example, offers free service on the company's time, including examination and prophylactic care twice a year for all of the employes. For prosthetic service (i. e., dentures and bridgework) and for operative service (i. e., gold and porcelain fillings), the employes are usually referred to private dentists in their communities, or, if they are not in a position to pay the regular fees, they are referred to a dental school clinic, where only a nominal fee is charged for such services.[16]

Many manufacturing establishments require a dental examination, together with a medical examination, for all who seek employment. The importance of oral hygiene is not overestimated, because many bodily ailments and many degenerative diseases have a close connection with unhealthy conditions in the mouth or with dental foci of infection, as is shown by a number of statistics compiled during the last two decades. The accompanying table presenting statistics taken from the records of the dental clinic of the home office of the Metropolitan Life Insurance Company, where 2,000 employes were examined, 1,000 showing good mouth conditions and 1,000, bad mouth conditions, shows the existing relation between mouth conditions and the health of the individual.[17]

STATISTICS FROM AN INDUSTRIAL CLINIC

Diseased Condition	Good Mouth Conditions	Bad Mouth Conditions
Neuralgia or neuritis	3.8	8.3
Headache	1.9	3.2
Nervousness	1.7	4.5
Colds	19.8	23.8
Furnucles (boils)	2.4	4.5
Abscesses	2.6	4.5
Albuminuria	0.9	3.3

It is asserted that 15,000,000 working hours are lost in British industry owing to oral sepsis.

15. Price, G. M.: Union Health Center Dental Clinic, J. A. D. A., 13:268 (Feb.) 1926.

16. Emmons, A. B.: Store Dental Service, J. A. D. A., 12: 1532 (Dec.) 1925.

17. Frankel, L. K.: Dental Clinics for Working Efficiency, J. A. D. A., 1:3-7 (July) 1927.

It follows, therefore, that the close cooperation of physician and dentist in the handling of these cases is much to be desired, if satisfactory results are to be obtained. This is especially true in those cases in which dental foci of infection produce chronic degenerative diseases, which lower the productivity of the employe, besides shortening his span of life. The results obtained in this connection are really astonishing, and the vast improvement in the general health of the workmen following the elimination of their mouth infections justifies the establishment of dental clinics in connection with medical clinics in industry.

But in addition to this close connection between mouth infections and general health, the importance of a clean, healthy mouth with a clean and efficient masticatory apparatus, free from pain and discomfort, alone would justify the existence of dental clinics in large industrial and commercial establishments. It was found in the factory of B. F. Goodrich Company that nearly 90 per cent of the workmen are in need of dental service[18]; and in the store of the Gilchrist Company, nearly 50 per cent of the employes were in need of crowns, bridges or partial or full dentures to restore efficient masticating surfaces,[19] and only two in ten people employed in stores were taking adequate care of the teeth and had clean mouths, while three in ten had altogether neglected mouths.

Taking into consideration, therefore, that the average working person cannot afford good dental service, even if he is educated to desire it, it follows that the industrial and the store dental clinic fits into the scheme for community dental service by assisting in providing this service for adults at a fee much nearer their means; the cost for this service being about $3 an hour, whereas private dentists usually charge from $10 to $25 an hour. At the same time, these people are educated to the importance of having restorative work done by the dentists of their communities; and thus these dentists are also benefited, having an additional opportunity for service, which probably never would have been sought, nor would it ever have been given by advertising quacks.

These clinics are usually supervised by practitioners of experience, and most of the service is performed by recent graduates. In some states in which dental nurses or hygienists are allowed to work at the dental chair, these clinics employ them to give prophylactic treatments under the supervision of the dentist in charge. In addition to dental services, education of the workmen in matters of oral hygiene is also conducted by the personnel of these clinics through the factory paper, bulletins, lectures and motion pictures.

The equipment consists of as many dental outfits as are necessary for the efficient carrying out of the work of each particular clinic. An x-ray machine is a part of the equipment of most clinics, and, in some instances, if there is no dental clinic connected with the medical clinic, the latter has a dental x-ray machine for oral examinations. Such an arrangement is being used by the General Electric Company in its Chicago factory.

It is a well known fact that dental clinics for school children exist in a great number of cities, but there is only one dental clinic for children in industry that I know of. Of course, when children of

18. Smith, C. E.: Dental Clinic of the B. F. Goodrich Company, Dent. Summary, 39:433 (June) 1919.

19. Hopkins, R. N.: Gilchrist Company Dental Clinic, Dent. Digest, 34:12 (Jan.) 1928.

above 16 years are working in establishments where dental clinics exist, they are taken care of in this way. The clinic to which I am referring takes care of school children of about 16 years of age before they enter employment, to enable them to get certificates permitting them to enter industry. This clinic, which has been established in Cincinnati, Ohio, offers service at cost or, to those unable to pay, free of charge.[20]

In Great Britain, industrial dental clinics have existed for more than twenty years, and their number has constantly increased. Their services are of a conservative nature, including, besides emergency treatments for all employes, prophylactic treatment, fillings and extraction for those under 21 years of age. These services are rendered free of charge, the cost being borne by the employer. Besides this industrial dental service, there exists also the National Health Insurance Dentistry. As all employed workers with small income are compelled to take out insurance against sickness and old age, the surplus funds are used for dental treatment of the insured workers, which is rendered by private dentists willing to undertake this class of work. A scale of fees has been worked out, and all insured workers of over 21 years can use the service. Their families are excluded from these benefits.[21]

In Germany, there are more than eleven industrial dental clinics conducted by the workers' sick benefit associations. Besides, each employe is covered by insurance against sickness, dental care included. There are more than 20,000,000 so insured.[22]

In France, Michelin & Company, of Clermont-Ferraud, have a dental clinic in their tire factory, employing four dentists and four laboratory technicians and rendering service to their 15,000 employes.

In Brazil, there are known to exist four dental clinics, one of which is the oldest known in the world, having been established since 1900. In Holland, dental service to workers is provided by means of sick funds. In Tasmania, the Electrolytic Zinc Company of Australasia, Ltd., has conducted a dental clinic since 1923 from funds offered by the company and money taken from the insurance funds.[22]

We may now summarize the benefits of industrial dental clinics as follows: Prophylactic treatments are rendered to persons who are unable to get them otherwise, and this opportunity acts as an incentive to them to take proper care of their mouths. These people are, therefore, educated on the importance of mouth hygiene and in proper care of their teeth. Their suspected teeth are examined by roentgen ray and the foci of infection are eradicated, and, in that way, closer cooperation of the dental and medical service is obtained. No medical clinic can be considered complete without a dental clinic, if serious illnesses are to be averted. And, finally, production is increased through good health and greater efficiency.[23]

20. Buntin, Ann L.: Dentistry for Children in Industry, J. A. D. A., 14:2293 (Dec.) 1927.

21. Shipway, W. H.: Dental Conditions in Great Britain, J. A. D. A., 14:548 (March) 1927.

22. Pettibone, E. L.: Report on Industrial Dentistry, J. A. D. A., 14:346 (Feb.) 1927.

23. Hyatt, T. P.: Industrial Dentistry and the Dental Profession, J. N. D. A., 8:322 (April) 1921.

CONCLUSION

If the industrial physician is supposed to have a sufficient knowledge of dental pathologic conditions to help him in general diagnosis, so should the industrial dentist acquire sufficient knowledge of the occupational diseases of the mouth to help him detect their incipient symptoms in his regular oral examinations.

55 East Washington Street.

DIRECTORY OF STATE SOCIETY OFFICERS AND DATES OF MEETINGS

ALABAMA

H. B. Peacock, President.....Opelika
F. F. Perry, Secretary-Treasurer.....Montgomery
Date of next meeting: April 15-17, 1930.
Place of next meeting: Montgomery.

ARIZONA

C. E. Matteson, President.....123 Stone Ave., Tucson
P. N. Williams, Secretary-Treasurer.....Route 3, Tucson
Date of next meeting: April, 1930.
Place of next meeting: Tucson.

ARKANSAS

C. C. Howard, President.....Jonesboro
I. M. Sternberg, Secretary-Treasurer.....Fort Smith
Date of next meeting: June 9-11, 1930.
Place of next meeting: Little Rock.

CALIFORNIA (STATE)

Wilfred H. Robinson, President.....American Bank Bldg., Oakland
F. T. West, Secretary.....2180 Washington St., San Francisco
Howard Dunn, Treasurer.....209 Post St., San Francisco
Date of next meeting: May 21-24, 1930.
Place of next meeting: Sacramento.

CALIFORNIA (SOUTHERN)

C. O. McBean, President.....Hollingsworth Bldg., Los Angeles
C. M. Alderson, Secretary.....609 S. Grand Ave., Los Angeles
F. G. Staley, Treasurer.....Roosevelt Bldg., Los Angeles
Date of next meeting:
Place of next meeting:

COLORADO

Harry B. Talhelm, President.....Republic Bldg., Denver
Joseph G. Ewers, Secretary.....Republic Bldg., Denver
M. S. Fraser, Treasurer.....Republic Bldg., Denver
Date of next meeting:
Place of next meeting:

CONNECTICUT

William L. Weed, President.....54 S. Main St., Norwalk
C. E. Peterson, Secretary-Treasurer.....34 Park Place, Rockville
Date of next meeting: April 22-24, 1930.
Place of next meeting: Stamford.

DELAWARE

Clyde A. Nelson, President ..... Milford
William Stewart, Jr., Secretary ..... Medical Arts Bldg., Wilmington
Philip A. Traynor, Treasurer ..... 807 Washington St., Wilmington
Date of next meeting: Jan. 8, 1930.
Place of next meeting:

DISTRICT OF COLUMBIA

Sterling V. Mead, President ..... 1149 16th St., N. W.
W. M. Simkins, Secretary ..... 720 Woodward Bldg.
Mark F. Finley, Treasurer ..... 1928 I St., N. W.
Date of next meeting:
Place of next meeting:

FLORIDA

W. J. Fitzpatrick, President ..... Calumet Bldg., Miami
Edward L. Thompson, Secretary-Treasurer ..... Daytona
Date of next meeting:
Place of next meeting:

GEORGIA

W. B. Childs, President ..... Georgia Casualty Bldg., Macon
G. A. Mitchell, Secretary ..... Candler Bldg., Atlanta
B. K. Vann, Treasurer ..... Candler Bldg., Atlanta
Date of next meeting: June 11-13, 1930.
Place of next meeting: Atlanta.

HAWAII

H. L. Houvener, President ..... Pantheon Bldg., Honolulu
J. A. Pekelo, Secretary ..... 471 S. Beretania St., Honolulu
G. S. Carreiro, Treasurer ..... 32 Young Bldg., Honolulu
Date of next meeting:
Place of next meeting:

IDAHO

B. M. Brookfield, President ..... Idaho Falls
A. G. Friedline, Secretary ..... Boise
T. L. Cartney, Treasurer ..... Filer
Date of next meeting:
Place of next meeting: Idaho Falls.

ILLINOIS

Hart J. Goslee, President ..... 108 N. State St., Chicago
A. B. Patterson, Secretary ..... Morris Bldg., Joliet
R. H. Daniels, Treasurer ..... Lehmann Bldg., Peoria
Date of next meeting: May 13-15, 1930.
Place of next meeting: Decatur.

INDIANA

Victor H. Knapp, President.....Citizens Bk. Bldg., Evansville
C. L. Byers, Secretary.....2138 N. Illinois St., Indianapolis
W. C. Hessler, Treasurer.....Ben Hur Bldg., Crawfordsville
Date of next meeting: May 19-21, 1930.
Place of next meeting: Indianapolis (Claypool Hotel).

IOWA

C. E. Westwood, President.....Frances Bldg., Sioux City
John Scholten, Secretary.....American Trust Bldg., Cedar Rapids
Frank Fourt, Treasurer.....Fairfield
Date of next meeting: May 6-8, 1930.
Place of next meeting: Des Moines.

KANSAS

C. K. Weaver, President.....Clay Center
Fred A. Richmond, Secretary.....Federal Reserve Life Bldg., Kansas City
W. T. Triplett, Treasurer.....Salina
Date of next meeting: April 21-23, 1930.
Place of next meeting: Topeka.

KENTUCKY

H. J. Patrick, President.....Paint Lick
Frank B. Hower, Secretary.....Heyburn Bldg., Louisville
Fred A. Millard, Treasurer.....Louisa
Date of next meeting: April 7-9, 1930.
Place of next meeting: Louisville.

LOUISIANA

T. S. Bennett, President.....Lake Charles
William J. Healey, Secretary.....Maison Blanche, New Orleans
O. J. Ory, Treasurer.....Garyville
Date of next meeting: April 3-5, 1930.
Place of next meeting: Lake Charles.

MAINE

I. E. Pendleton, President.....Lewiston
W. D. Taylor, Secretary.....Mechanic Falls
D. S. Roberts, Treasurer.....Portland
Date of next meeting: June 19-21, 1930.
Place of next meeting: South Poland (Poland Spring House).

MARYLAND

Wiley W. Smith, President.....230 N. Charles St., Baltimore
Norval H. McDermott, Secretary.....Medical Arts Bldg., Baltimore
Walter E. Green, Treasurer.....2598 W. North Ave., Baltimore
Date of next meeting: May 5-7, 1930.
Place of next meeting: Baltimore.

MASSACHUSETTS

Thomas K. Ross, President.....280 Main St., Fitchburg
Philip E. Adams, Secretary.....236 Newbury St., Boston
Joseph T. Paul, Treasurer.....419 Boylston St., Boston
Date of next meeting: May 5-9, 1930.
Place of next meeting: Boson (Copley-Plaza).

MICHIGAN

P. J. O'Reilly, President.....4622 Grand River Ave., Detroit
William R. Davis, Secretary.....State Dept. of Health, Lansing
E. J. Chamberlain, Treasurer.....Ashton Bldg., Grand Rapids
Date of next meeting: May 5-7, 1930.
Place of next meeting: Detroit (Statler Hotel).

MINNESOTA

R. O. Green, President.....Lowry Bldg., St. Paul
George D. Estes, Secretary.....Yeates Bldg., Minneapolis
T. D. Abernathy, Treasurer.....Rochester
Date of next meeting: February 26-28, 1930.
Place of next meeting: Minneapolis.

MISSISSIPPI

B. B. Kennedy, President.....Jackson
J. H. Brown, Secretary-Treasurer.....Newton
Date of next meeting:
Place of next meeting: Jackson.

MISSOURI

E. H. Keys, President.....Univ. Club Bldg., St. Louis
C. W. Digges, Secretary.....Columbia
James F. McLellan, Treasurer.....Moberly
Date of next meeting: May 19-22, 1930.
Place of next meeting: St. Louis (Jefferson Hotel).

MONTANA

C. L. Smith, President.....Missoula
J. E. Buehler, Secretary-Treasurer.....Great Falls
Date of next meeting: April 3-5, 1930.
Place of next meeting: Great Falls.

NEBRASKA

F. W. Webster, President.....Security Mutual Bldg., Lincoln
Roy R. Ralston, Secretary.....Medical Arts Bldg., Omaha
Guy L. Spencer, Treasurer.....Sharp Bldg., Lincoln
Date of next meeting: May 19-22, 1930.
Place of next meeting: Lincoln (Lincoln Hotel).

NEVADA

*J. A. Blalock, President.....Reno
P. H. Phillips, Secretary-Treasurer.....Medico-Dental Bldg., Reno
Date of next meeting, June, 1930.
Place of next meeting: Reno.

NEW HAMPSHIRE

G. E. Flagg, President.....Nashua
W. J. Moyles, Secretary.....1061 Elm St., Manchester
W. A. Young, Treasurer.....40 N. Main St., Concord
Date of next meeting: June 4-6, 1930.
Place of next meeting: Laconia.

NEW JERSEY

Edward L. Wharton, President.....50 James St., Newark
F. K. Heazelton, Secretary.....223 E. Hanover St., Trenton
George H. Griffith, Treasurer.....42 W. State St., Trenton
Date of next meeting: April 30-May 3, 1930.
Place of next meeting: Asbury Park (Berkeley-Carteret Hotel).

NEW MEXICO

C. C. Robinson, President.....Albuquerque
Fred Muller, Secretary-Treasurer.....Taos
Date of next meeting: October, 1930.
Place of next meeting: Albuquerque.

NEW YORK

William C. Fisher, President.....Bronxville
A. P. Burkhart, Secretary.....57 E. Genesee St., Auburn
George H. Butler, Treasurer.....Skaneateles
Date of next meeting: May 13-16, 1930.
Place of next meeting: New York City (Hotel Commodore).

NORTH CAROLINA

John H. Wheeler, President.....Greensboro
Dennis F. Keel, Secretary-Treasurer.....Greensboro
Date of next meeting: May 5-8, 1930.
Place of next meeting: Asheville (Battery Park Hotel).

NORTH DAKOTA

C. E. Johnson, President.....Valley City
L. I. Gilbert, Secretary.....Fargo
L. E. Musberger, Treasurer.....Jamestown
Date of next meeting:
Place of next meeting: Bismarck.

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*Deceased.

OHIO

Earl S. Braithwaite, President.....Union Bldg., Cleveland
E. C. Mills, Secretary.....255 E. Broad St., Columbus
Harry Cope, Treasurer.....327 E. State St., Columbus
Date of next meeting: December 3-5, 1929.
Place of next meeting: Columbus.

OKLAHOMA

Roy H. Ellis, President.....McCulloch Bldg., Okmulgee
E. E. Sanger, Secretary.....Yukon
C. B. Ball, Treasurer.....Frederick
Date of next meeting: April 21-24, 1930.
Place of next meeting: Tulsa (Mayo Hotel).

OREGON

C. B. Willoughby, President.....Eugene
F. W. Hollister, Secretary.....Medical-Dental Bldg., Portland
H. W. Titus, Treasurer.....Eugene
Date of next meeting:
Place of next meeting: Eugene.

PENNSYLVANIA

Z. T. Jackaway, President.....1506 E. Susquehanna Ave., Philadelphia
C. W. Hagan, Secretary.....1011 Macon Ave., Swissdale
J. A. Brady, Treasurer.....2108 N. Broad St., Philadelphia
Date of next meeting: May 6-8, 1930.
Place of next meeting: Philadelphia.

RHODE ISLAND

Raymond W. Gatchell, President.....86 Weybosset St., Providence
Harry F. McKanna, Secretary.....West Warwick
Thomas W. MacKnight, Treasurer.....119 Church St., Newport
Date of next meeting:
Place of next meeting:

SOUTH CAROLINA

E. H. Wyman, President.....Aiken
N. W. Macaulay, Secretary.....Columbia
G. M. Meares, Treasurer.....Columbia
Date of next meeting: May 20-22, 1930.
Place of next meeting: Columbia.

SOUTH DAKOTA

Harry Y. Mann, President.....Mobridge
Ernest W. Elmen, Secretary.....Sioux Falls
J. W. King, Treasurer.....Aberdeen
Date of next meeting: May 12-14, 1930.
Place of next meeting: Sioux Falls.

TENNESSEE

E. S. Landess, President.....Fayetteville
R. P. Moss, Secretary-Treasurer.....Broad St., Kingsport

Date of next meeting: May 12-15, 1930.
Place of next meeting: Nashville.

TEXAS

G. H. Mengel, President.....Roberts Banner Bldg., El Paso
J. G. Fife, Secretary-Treasurer.....Medical Arts Bldg., Dallas
Date of next meeting: May 13-16, 1930.
Place of next meeting: Fort Worth.

UTAH

Hyrum Bergstrom, President.....229 7th St., Salt Lake City
T. Fred Hardy, Secretary-Treasurer.....Medical Arts Bldg., Salt Lake City
Date of next meeting: June, 1930.
Place of next meeting: Ogden.

VERMONT

Carter R. Woods, President.....Rutland
E. B. Jenney, Secretary.....Rutland
Howard F. Killary, Treasurer.....Burlington
Date of next meeting: May 21-23, 1930.
Place of next meeting: Burlington.

VIRGINIA

J. E. John, President.....Shenandoah Life Bldg., Roanoke
A. M. Wash, Secretary-Treasurer.....Medical Arts Bldg., Richmond
Date of next meeting:
Place of next meeting: Richmond.

WASHINGTON

Robert Bell, President.....Paulsen Bldg., Spokane
W. G. Crosby, Secretary-Treasurer.....Medical Dental Bldg., Seattle
Date of next meeting: March, 1930.
Place of next meeting: Spokane.

WEST VIRGINIA

F. M. Farnsworth, President.....Buckhannon
J. E. Herbert, Secretary.....Martinsburg
J. S. Stone, Treasurer.....Clarksburg
Date of next meeting: May 19-21, 1930.
Place of next meeting: Fairmont.

WISCONSIN

D. P. Wheeler, President.....23 N. Pinckney St., Madison
R. W. Huegel, Secretary.....104 King St., Madison
H. S. Huxtable, Treasurer.....Mineral Point
Date of next meeting: July 9-11, 1930.
Place of next meeting: Milwaukee.

WYOMING

G. L. Morris, President.....Green River
E. C. Andrew, Secretary.....Citizens Bk. Bldg., Cheyenne
Peter Appel, Jr.., Treasurer.....Hynds Bldg., Cheyenne
Date of next meeting: June, 1930.
Place of next meeting: Sheridan.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Dietary Control of Dental Caries: A further study of diet as a means to control caries is reported by Boyd, Drain and Nelson (*Am. J. Dis. Child.*, October, 1929). An earlier study reported arrest of caries in the teeth of diabetic children who for periods of two months or longer had received carefully controlled diets designed to conserve the sugar-handling mechanism, and further study has confirmed these early observations. The diet in these diabetics differed from that considered optimal for the normal child in that 70 per cent of the calories were supplied by fat, and, in addition, insulin was being given in practically every case. The present study was undertaken to determine whether the arrest of caries was explained by these departures from the regimen of the normal child or by the adequacy of the diet. Four children in the orthopedic ward were given a diet similar to that given the diabetic group in the earlier experiment, no insulin being given, however. After two months, although all four children had had active and extensive caries, the dentin became of stony hardness and there was no further advance in the destructive process. Two children of this group who returned to the ward routine after several months developed active caries, although the ward food was designed to meet the needs of the child fully. That it is possible to accomplish arrest of caries in the home was determined by selecting preschool children for experimentation and obtaining the cooperation of the parents in assuring for them the intake of recognized essential minerals and vitamins in considerable amounts. A careful record was kept of the food actually eaten each day. It was specified that each child should receive daily a quart of milk, one egg, a teaspoonful of cod liver oil, one ounce of butter, one orange, two or more servings of succulent vegetables and of fruits, and such other food as he desired. Candy was allowed only after meals. Nonessential foods that might displace some of the prescribed items of diet were prohibited. In all five children following the stipulated régime, caries was arrested within ten weeks or less time. All gained in weight except one that developed an otitis media. A further test was made with four girls having celiac disease, in which tendency to caries is very marked. The two younger children had not developed caries, and did not, and caries was arrested in the older two. The diet was that prescribed to correct celiac disease, i. e., simple sugars and protein were the source of nutrition. The authors say: "In correlating the diets of these four groups of children, it is apparent that they differ widely yet seem equally effective in arresting caries. In one, calories were supplied principally as simple sugars, and fats were avoided as much as possible; in another, fats furnished most of the energy, and only enough carbohydrate was used to make the diets antiketogenic. In certain essential features, however, the diets were similar. Each child received cod liver oil, orange or tomato juice, milk, vegetables and fruits daily, in amounts designed to meet the requirements for vitamins and minerals. The protein allowance in every instance was at least a gram per pound of body weight. Whatever the factors essential for dental integrity, they apparently are supplied by these foodstuffs." The authors answer the question as to why caries is so prevalent when simple foods are adequate preventives by saying that children's diets are evidently not so adequate as they appear to be. More careful supervision is called for. These observations indicate that tooth decay is primarily dependent on metabolic changes. The factor of acidity is ruled out by experimentation showing that acidity was not reduced in the mouth in which caries was arrested. Large cavities were in many instances left unfilled for months in the mouths of children who were eating a general diet including bread,

potatoes and candy, but were receiving the foods specified as essential. In none of these mouths did caries progress. Oral hygiene was poor in many of the cases examined, but this did not prevent the arrest of caries. The authors conclude that active caries is indicative of nutritional deficiencies.

Ethyl Chlorid in Dentistry: The principal advantages of ethyl chlorid as a general anesthetic in dentistry are, according to R. M. Olive (*Cur. Res. Anes. & Anal.,* July-August, 1929), the brevity of the anesthetic stage and the absence of undesirable after-effects. The author has used ethyl chlorid with such satisfaction for six or eight years that he has practically discontinued the use of somnoform and nitrous oxid. That the United States has been slow to give ethyl chlorid the preference shown it in Europe is explained by the fact that doubts have been entertained as to its safety, owing to accidents occurring in unskilled hands. Further, the earlier preparations were not free of impurities. Respiration is increased in depth but not in frequency. The anesthetic is rapidly absorbed by the blood and eliminated with equal rapidity. The first stage is that of analgesia, the second, incomplete anesthesia. This stage is of only a few minutes' duration, and it is seldom necessary to go beyond this in a dental operation. The third stage, or complete anesthesia, is characterized in about 20 per cent of cases by vomiting or dizziness. If the patient has been properly prepared for the anesthesia, the untoward after-effects are practically nil. (The anesthetic should not be administered immediately after a heavy meal, and the clothing should not be tight.) As to the dangers of ethyl chlorid anesthesia, it is usually classed between ether and nitrous oxid, with a mortality of one in 17,000. It is interesting to note that Gwathmey states that the probable death rate for nitrous oxid-oxygen is one in 10,000. Hadfield, of London, considers it "little if any more dangerous than nitrous oxid." Ross, Cantile and Mortimer consider it preferable to nitrous oxid for short operations. Dr. Howe replies to an inquiry of the author that in 100,000 administrations of ethyl chlorid as a general anesthetic, no fatalities or alarming post-operative effects were noted at the Forsyth Dental Infirmary. The author considers ethyl chlorid as especially suited to dental operations in children. A conservative policy would regard the presence of respiratory affections, organic heart lesions and severe kidney disease as a contraindication to its use.

Agranulocytosis Associated with Anal Ulcer: R. W. Buck reports a case of agranulocytosis in a woman, aged 45, in which an anal ulcer was the only ulcerative lesion. (*J.A.M.A.,* Nov. 9, 1929.) The gums and oral mucous membranes were normal, but the tongue was red and had a brownish coat and a few sordes. The patient died about five weeks after she entered the hospital, and ten weeks after she first became ill.

Brain Abscess from Vincent's Infection Following Tooth Extraction: A fatal case of brain abscess from Vincent's infection following extraction of a tooth under procain hydrochlorid, is reported by L. E. Thompson (*J.A.M.A.,* Oct. 5, 1929.) The patient, a woman, had had the right upper second molar extracted, March 25, 1929. Pain developed in the right ear three days thereafter, and, April 2, a physcian was called. There was infection of the external canal of the ear and the patient was unable to open her mouth. A smear showed Vincent's organisms, and neoarsphenamin was administered intravenously. Pain became severe and there was a rise in temperature to 101 F., following a chill. There was slight swelling of the right side of the face, especially over the right parotid area and in the temporal region. During the next few days, the temperature continued to rise and swelling increased. Morphin was given for pain and applications were made over the area of swelling. Ten cubic centimeters of foul smelling pus was aspirated from the sphenopalatine fossa from inside the mouth. There was improvement thereafter for a short time. A smear showed Vincent's organisms. The patient became worse, with higher temperature, increased swelling and delirium. Temporary improvement resulted from administration of one-fourth grain of strychnin hypodermically. Drainage was free and smear again showed the Vincent organisms. Incision was made to increase drainage, the maxillary sinus being opened through a tooth socket and an incision being made through the skin along the lower border of the right inferior maxilla to the under surface of the parotid gland. A transfusion was made, but the patient continued unimproved, death ensuing, April 16.

Necropsy revealed an abscess in the sphenopalatine fossa extending by way of the middle meningeal vein to the longitudinal sinus, both of which contained pus. There was an abscess of the right temporal lobe, moth eaten in appearance, typical of Vincent's infection and presenting Vincent's organisms on smear. There were abscesses in both orbits and there was thrombosis of the cavernous sinus, Vincent's organisms being found on smear from both.

FOREIGN LITERATURE

Orthodontic Diagnosis (Gustav Korkhaus, Fortschr. d. Zahnheilk., No. 9, 1929, p. 810): The greatest uncertainty in the specialty of orthodontia is found in the selection of proper appliances, as this depends on the correct diagnosis of the case. Until quite recently, orthodontia was undertaken largely because of "looks." Diagnosis was generally superficial, for the chief or underlying causes were overlooked. To Angle must go the credit for correcting this discrepancy. With his classification, he brought an end to the old practices. While Angle entirely disregarded earlier diagnostic methods and adopted occlusion of the molars as a basis for his method, he likewise went to extremes; for, according to Angle's own statistics, 75 per cent of all irregularity cases fall in Class I, yet all that this classification tells us is that the mesiodistal relationship of the molars is normal. This class links together anomalies of the most heterogeneous nature and origin. The designation of the class gives no clue as to the type of irregularity nor the nature of the treatment required. In Figure 510 are illustrated nine extremely different types of malocclusion, including compression anomalies, vertical anomalies, open bite and irregularities resulting from extractions of various kinds. All are linked with the rather loose symptoms of normal mesiodistal molar relationship. What is true of Angle's Class I is also true of all the other classes. One who has had the opportunity of examining many cases of irregularity must know that the mesiodistal relationship does not constitute a very important or differentiating characteristic. Many cases that are absolutely related in origin and type of irregularity often manifest a variable molar relationship. Some cases are illustrated in Figures 511-513. For cases of pronounced overbite in distal occlusion, Angle created a Division 2 in Class II. This type of irregularity occurs just as frequently in neutral occlusion as in distal occlusion; still Angle places the latter in Class II, while he places the same type with normal mesiodistal molar relationship in another class, the large Class I. For purposes of classification, the mesiodistal relationship of molar teeth is not reliable. The assumption of Angle that the upper molar always assumes a constant position has in recent years been proved a myth. The studies and measurements of skulls by Sicher and Krasa and Oppenheim, as well as Pfaff, have proved the futility of this assumption. The lower jaw is not always at fault in cases of faulty mesiodistal relationship of the molars; protusion of the whole upper dentition does occur (Figs. 818-823).

The work of Linder and Harth is developing interesting facts pertaining to cephalometric diagnosis. The assumption of Simon that a constant relationship exists between the orbital point and the cuspid during the entire development from temporary to permanent teeth has been shown to be false. Statistics plotted in graph show a great variability in the orbital tooth relationship. The orbital-cuspid line falls more distally with advancing age groups. In groups between 6 and 8 years, the orbital projection bisected the tips of the cuspids in 37 per cent of the cases. In groups between 12 and 14 years of age, the projection passed distally to the tips of the cuspids in 40 per cent of the cases; and in the groups between 16 and 18 years of age, the line passed just distally to the cuspid in 23 per cent of the cases. There is no fixed relationship between any of the points of the skull and the teeth. The variability of the normals is so great that no fixed rule concerning relationship and treatment can be established. By what method is the practitioner to determine which of the jaws is responsible for the irregularity if the cephalometric or gnathostatic methods are not reliable? In this connection, it is interesting to mention the fact that practically all the methods voluntarily or involuntarily fall back on the analysis of the profile. Profile photography and profile analysis, according to the improved methods of Kantorowicz, form the most reliable basis for a diagnosis. This method allows for normal variability and still aids in the localization of the anomaly.

EMIL MUELLER, Chicago.

Two Cases of Aspiration of Teeth into the Lung During Extraction Under General Anesthesia (Max Melchior, Ztschr. f. Stomatol., No. 9, 785, 1929): One of the greatest dangers in dental practice is the aspiration of foreign bodies into the trachea or the lungs. During extractions, it occasionally happens that a tooth or a root flies back against the pharynx and thus can be aspirated. When many teeth and roots are extracted at one time under general anesthesia, the danger of aspiration is an especially great one, as it is possible for the operating dentist not to know that a root or a piece of a tooth is missing.

The author gives the detailed records of two cases. In both cases, many roots and teeth were extracted at one time under anesthesia. Shortly after extraction, the patient began to cough. The cough grew worse within the next few days, and there was pain in the chest, with a high fever. Twenty-six days after the extraction, during a vehement attack of coughing, a tooth was expectorated. Thereafter, the pain and fever slowly abated, and after a month, the patient was again in a normal condition. In the second case, many badly decayed roots were extracted under anesthesia. These roots were covered by inflamed gingiva. As the extraction required a rather long time, the dentist was not aware that a root was missing. Two days thereafter, the patient began to cough, and a high fever, with pain, developed, and there was copious expectoration. About two months after the operation, a root was located by the roentgen ray in the lower posterior part of the left lung. Several attempts were made to reach the root by bronchoscopy and to remove it with an instrument, but these attempts were unsuccessful, as it seemed to be very tightly wedged in the bronchus. The general condition of the patient grew rapidly worse, and she died with symptoms of an abscess of the lung. At necropsy, it was found that an abscess had perforated into the pleura. The tooth, a root of a bicuspid, was found during the postmortem.

The author presents a complete record of cases of aspiration occurring during dental work. Most of them deal with small instruments, such as files or needles, as well as parts of teeth or fillings. There are a few cases reported in which small metal objects healed in and were incapsulated in the lung without any reaction. But the aspiration of infected roots always caused very bad symptoms and a severe reaction because of the presence of many pathogenic bacteria. As a rule, the patient should be taken to a hospital and a bronchoscopy performed, as the presence of an infected tooth in the lung means immediate danger to the patient from pneumonia or gangrene of the lung. The prevention of these accidents, which is of the utmost importance, can be assured only by care during extraction, local instead of general anesthesia, good light and adequate assistance. If there is any possibility of aspiration, the dentist should not delay having an immediate examination made of the patient by a specialist.

RUDOLF KRONFELD, Chicago.

Histologic Findings in the Jaw in Cases of Sepsis and Leukemia (Franz Schoenbauer, Ztschr. f. Stomatol., No. 9, 804, 1929): Investigations were made on jaws of patients who had died of sepsis and leukemia, in order to discover what reactions had taken place in the bone marrow. In a case of a patient, aged 48, who had died of sepsis, the whole bone marrow showed very dense cell proliferation. The cells were especially dense around the blood vessels in the marrow. A comparison with another jaw of a patient of the same age who had died of another disease showed fat-marrow everywhere without cells. The peridental space and the pulp in the septic case were free of infiltration. In a case of leukemia in a child, dense cell proliferation was found in the marrow and a leukemic ulcer was present on the gingiva. In two of the permanent tooth germs of this child, a focus of proliferation of myeloid cells in the pulp could be seen.

RUDOLF KRONFELD, Chicago.

Trioxymethylene as a Therapeutic for Sensitive Dentin (G. Jasswoin, Ztschr. f. Stomatol., No. 8, 722, 1929): Trioxymethylene was recommended in 1914 by Buckley for the anesthetization of sensitive dentin. Since that time, there have been widely different reports on the action of this drug. Some authors report a satisfactory action on the dentin, with no damage to the pulp; others, that trioxymethylene penetrated the dentinal tubuli and the pulp died. The author made the observation that, in deep cavities, the drug caused an irritation of the pulp; the patient

felt pain, and, if the drug was not quickly removed, the pulp died. In superficial or shallow cavities, the action on the dentin is sufficient, enabling the operator to work on the dentin without pain. In such cases, the pulp is not damaged, and later gives a normal reaction. In testing the action of trioxymethylene on dog's teeth, the author found degeneration, infiltration, and later on necrosis of the underlying pulp, after the application in deep cavities. In small and shallow cavities, the pulp did not show decided changes, and recovered later. From his clinical as well as his experimental results, the author draws the conclusion that trioxymethylene should be used only in shallow cavities, where it has a good anesthetizing effect on the sensitive dentin. It should not be applied in deep cavities, as it is dangerous to the pulp. In the latter cases, pressure or infiltration anesthesia should be used.

RUDOLF KRONFELD, Chicago.

MISCELLANY

BOOK REVIEWS

The Business Conduct of an Ethical Practice. An Exposition of the Application of Business Principles to the Practice of Dentistry Without Transgressing the Rules of Ethics. By S. Joseph Bregstein, D.D.S., Brooklyn, N. Y., Attending Periodontist, Unity Hospital, Brooklyn; Formerly Periodontist, Samaritan Hospital, Brooklyn; lecturer on dental economics, and writer on professional business management. Illustrated; 132 pages; price, $4.00. Published by Dental Items of Interest Publishing Co., Inc., Brooklyn, N. Y., 1929.

There seems to be a general awakening to the importance of the business side of dentistry, and it is well that a legitimate amount of attention be given to this aspect of our professional life; but we hope that the time will never come when this phase of our practice shall assume the ascendancy over the strictly professional and highly ethical interests of our activities. When the time arrives that dentistry becomes solely a business and is not a profession, our status in the eyes of the world will sink immeasurably, and we shall lose the prestige that has been laboriously built up by self-sacrifice on the part of those sturdy pioneers who first gave color and form to our professional birthright.

It is evidently the aim of the author of this book to teach those principles that make not only for economic success but for professional standing as well. The book might well be classed as a *vade mecum* of dental practice, taking up as it does a great variety of subjects which have a bearing on a practitioner's success or failure in life. It touches briefly on many of the influences which should govern the conduct of a professional practice, and it introduces many a human touch which marks the contact between practitioner and patient.

A very impressive feature of the book relates to the excellent work done on it by the publisher. The paper and type are beyond all praise and it is a volume that must appeal strongly to the reader who likes good workmanship.

Dental Bibliography. A Reference Index to the Literature of Dental Science and Art as Found in the Libraries of the New York Academy of Medicine and Bernhard Wolf Weinberger. Compiled by Bernhard Wolf Weinberger, D.D.S., Librarian of the First District Dental Society; Advisory Librarian, Dental Library New York Academy of Medicine. Ed. 2. Published under the auspices of the First District Dental Society, State of New York.

To accomplish a task of the magnitude of Dr. Weinberger's is no mean achievement. While of course the libraries treated in this volume do not contain all the books there are in dental literature, it is amazing how the bibliography runs up. To compile all of this has required an enthusiasm and industry that is most commendable, and the author is entitled to the thanks of the profession. He has added much to bibliographic science and contributed to our permanent literature.

Paul Adams—A Novel of an American Dentist. By S. J. Horn. Published by Benedict Publishers, Inc., New York.

This novel deals with the career of a young dentist who was a descendant of one of the leading pioneers of the profession. There is portrayed the constant struggle between an

ethical professional man and the flashy fly-by-night sort of dentist who thinks more of the money he can make than of maintaining the reputation of the profession. The author, though not a dentist, shows a great familiarity with dental practice, and the book is filled with incidents of a typically professional character. We could have wished that in the handling of his chief character he might have found it possible to allot to him a greater success in life, and also to have stressed less the sordid side of professional practice and of life itelf. It is true that the descendants of great men do not always make good, but we know of at least one instance where three generations of dentists in one family have typified the highest and best in professional life, and doubtless there are many others. With the antecedents of Paul Adams, it might have been logical to assign him a more honorable professional career without offending the canons of heredity or of professional experience. The book has many vivid touches of real life and will be found interesting to those who have practiced a profession.

ANOTHER DENTAL BENEFACTOR

Last September, the trustees of the Rhode Island Hospital announced the receipt of a gift of $300,000, to be used to erect a building to be devoted to dentistry for children. The gift was from Col. Joseph E. Samuels, of Providence, whose attention was called by a member of the dental profession several years ago to the needs of the poor children of the adjoining city of Cranston, where he then resided. Two such clinics were established and proved a great success, but Colonel Samuels was impressed with the inadequate means for dealing with the great number of children requiring care. It become obvious that to cope with this condition would require a large building well equipped, and a staff to deal with at least fifty children a day. Such facilities did not then exist in Providence. Further, as to the question of location, this member of the dental profession suggested the Rhode Island Hospital; which was fortunate, as Colonel Samuels said that he had this very hospital in mind. The Rhode Island Hospital will be the first of its kind in the world to have as an organic part a department for children's dentistry, housed entirely separately with its own staff, yet under the control of the board of trustees.

The staff will consist of recent graduates under a competent supervisor, to insure good and careful dentistry. It is felt that with the opportunity to apply what they have recently acquired, the fostering of closer medicodental relations, with the facilities of the main hospital, in addition to those of the children's Infirmary, for research work, and the extension courses at Brown University, a fine group of dentists will be attracted to it.

This gift of Colonel Samuels, besides furnishing dental service for needy children, will make the foregoing program possible, and it is felt that words of praise are inadequate to express the thanks of the community. He has also established his name for all time beside the names of Forsyth, of Boston, and Eastman, of Rochester. He is receiving many messages of appreciation and thanks from the dental profession.

DEATH OF DR. MORISHITA

Dental Research suffered a severe loss, July 2, 1929, in the death of Toshiki Morishita. At the time of his death, he was connected with the Department of Bacteriology of Yale University, where he was engaged in a study of dental bacteriology and pathology.

Dr. Morishita was born in Japan in 1896. He graduated from the Tono High School, and, in 1914, entered Tokyo Dental College, from which he graduated in 1918. For a few years, he practiced in Japan, but the problem of dental decay became of such importance to him that he gave up this practice and came to America to engage in investigative work. He first entered the Toronto Dental College, receiving the dental degree.

After doing special work at McGill and Howard Universities, where he laid the foundation for his investigative work, he entered the Division of General Bacteriology of Yale University, where for over two years he conscientiously pursued his research activities.

His chief interest was in the question of dental decay, more particularly the influence of high-acid producing and tolerating organisms which he found to be so intimately connected with the progress of caries. The first report of his efforts appeared in the September, 1929, *Journal of Bacteriology*. Further than this, he had accumulated the necessary data for several further contributions, which it is hoped will eventually be correlated and published as his work.

Leo F. Rettger, professor of bacteriology at Yale, says of him, "Dr. Morishita was particularly well qualified as an investigator in the field of scientific dental research. He was brilliant in the conception and execution of his complex problem. He was ceaseless in his devotion to his work, and had attained a degree of success in his chosen field which promised a bright future."

His death was due to an acute respiratory infection, leading to pulmonary thrombosis.

The remains were cremated and after a funeral in New Haven were sent back to his home in Japan.

It is extremely unfortunate that at the time that dental research is being so widely fostered and its need so strenuously felt, it should have suffered the loss of one who might have been among its most brilliant leaders.

WILLIAM G. DOWNS, JR.,
New Haven, Conn.

INTERNATIONAL DENTAL FEDERATION

The International Dental Federation held its annual meeting this year in the university building at Utrecht (Holland), August 7-11. Official representatives of dental societies in eighteen countries were present. Dentists of forty countries are associated with the I. D. F. It consists of the executive committee, in which the countries concerned are represented by from one to five votes, according to the number of their dentists, and of nine commissions. The objects of the I. D. F., according to Article 2 of the statutes are:

(a) Acceptance or rejection of invitations by various countries to hold a regular international dental congress, and to fix the date and place where such congress shall be held.
(b) Maintenance and strengthening of the ties that bind the national societies to each other.
(c) Organization of such international commissions as it may deem necessary to create.
(d) In a general way, promotion of the organization of bodies that will contribute to the advancement of odontologic science throughout the world.
(e) Awarding of the international Miller prize.

The labors of the executive committee and of the commissions furthered these objects during the meeting at Utrecht. Reports under this head will be issued later. In particular, the arrangements for the next international congress, at Paris in August, 1931, which had been submitted by the Paris organization committee, were approved.

The Eighth International Dental Congress will be held in Paris, August, 1931.

On the occasion of the meeting at Utrecht, the Association of Dutch Dentists organized a congress with a mouth hygiene exhibit. A. L. T. C. van Hasselt, of The Hague, presided.

The congress dealt in three sections with all important questions of mouth hygiene. Thirty-eight papers were read by Dutch and foreign colleagues. These papers have been published in a special number of the *Tijdschrift voor Tandheelkunde*.

The exhibition was held in two rooms of the university. One room contained the exhibits from Holland, the other those from America, Belgium, Canada, Germany, England, France, Japan, etc. The exhibition demonstrated valuable material, especially for propaganda purposes among children and adults in the interest of the hygiene of the mouth and teeth. The exhibition was open to the public, who visited it in large numbers. Films on mouth hygiene from America, England, Germany, Holland and France were shown.

Industrial exhibits gave the Dutch and foreign dentists the opportunity to study innovations in instruments, etc.

All the foreign participants were most enthusiastic in their praises of the hospitality of their Dutch colleagues. The meeting was most successful in every respect.

Following are the officers of the Federation: Chairman, Viscount de Casa Aguilar, Madrid; Secretary, George Villain, Paris, France; Treasurer, A. L. T. C. van Hasselt, The Hague, Holland.

KONRAD COHN, (Berlin)
HANS EGON BEJACH, (Berlin)
Press Committee of the I. D. F.

NEWS

Dr. Bogle Honored: A testimonial dinner was given in honor of R. Boyd Bogle, newly elected President of the American Dental Association, by the Nashville Sixth District Dental Society of the State of Tennessee, November 8, at the Belle Meade Country

Club, Nashville. C. W. Hoffer of Nashville, presided, and Thomas P. Hinman, of Atlanta, Ga., was toastmaster. Toasts were given by C. N. Johnson, of Chicago, Ill., George L. Powers, of Memphis, Tenn., Frank W. Rounds, of Boston, Mass., Holmes Mason, of Macon, Ga., A. J. Cottrell, of Knoxville, Tenn., and W. A. Bryan, J. H. Phillips and Neale M. Rutland, of Nashville.

Dr. van den Berg Returns Home: E. J. van den Berg, who with Mrs. van den Berg, spent several months in this country, has returned to his home in Amsterdam. Dr. van den Berg received his dental education in Chicago, graduating from the Chicago College of Dental Surgery in 1911. While in the United States, he visited various dental centers, after attending the Annual Session of the American Dental Association in Washington.

Patent Rights on "Germ Popper" Awarded: According to report, after twelve years of litigation, United States letters patent have been awarded to David Crowther, formerly of the University of Minnesota, but now associated with Columbia University, on an apparatus known as a "germ popper," and designed to kill bacteria to be used in the preparation of vaccines without subjecting them to heat or chemicals, which have the effect of impairing their efficacy. The bacteria are subjected to intense pressure under an inert gas, and, on removal of the pressure, are disrupted and thus destroyed. The other claimants to the invention were W. P. Larson and T. B. Hartzell, who, according to report, had called in Mr. Crowther, an expert mechanic and an inventor, to perfect a pressure method for killing bacteria which had failed to insure the death of all the organisms. Experiments continued to give unsatisfactory results, and Mr. Crowther continued experimenting with another method, later applying for a patent. Dr. Larsen also applied for a patent on a similar apparatus. Litigation was instituted, and the first decisions were in Mr. Crowther's favor. These decisions were reversed by the court of appeals of the District of Columbia. An appeal filed by Mr. Crowther to the federal court of Minnesota resulted in a decision in his favor. Dr. Larsen then carried the case to the federal court of appeals and finally to the Supreme Court of the United States, both of which refused to disturb the decision of the lower court, with the result that Mr. Crowther's rights are incontestably established. The patents were granted, September 17.

Guggenheims Buy Dental Clinic Site: The first unit in the chain of free dental clinics to be established by the Murray and Leonie Guggenheim Foundation will be on Seventy-Second Street, New York City, between First and York Avenues. The foundation has purchased the plot and will expend, it is reported, more than $3,000,000 for the construction, equipment and endowment of the unit. The old tenements on the site will be demolished. Plans for the first dental clinic are being made. Among the charter members of the Guggenheim Foundation is Dr. S. S. Goldwater, formerly city health commissioner and director of Mount Sinai Hospital.—*J. A. M. A.*

Statistics on Prevalence of Physical Defects and Pathologic Conditions: In a survey covering the extent of illness and of physical and mental defects prevailing in the United States, conducted by Alden B. Mills for the Committee on the Cost of Medical Care, the occurrence of dental defects as shown by examinations by the Life Extension Institute of more than 100,000 males in the prime of life was as follows: heavy dentistry (roentgen-ray examination recommended), 39 per cent; slightly infected gums, 18 per cent; carious teeth, septic roots, 15 per cent; definite pyorrhea, 6 per cent. Of 10,000 adult male industrial workers examined, defective teeth and pyorrhea were found in 6,093.

Dr. Sale Honor Guest of Dental Society: Frank Orvil Sale, of Urbana, Ill., was recently honored at a banquet given by the Twin City Dental Society and attended by 110 dentists and their wives from that part of the state. The dinner, which was given at the Urbana Country Club, was in recognition of Dr. Sale's completion of fifty years of active practice in Urbana. "Chic" Sale, widely known comedian and writer, and the son of Dr. Sale, was present and entertained the guests with character readings at the close of the program of toasts and musical selections.

"Painless" Parker Barred from Practice in Colorado: The Supreme Court has upheld the action of the attorney general of Colorado in barring the Painless Parker Dentists, a California corporation, from practicing dentistry within the boundaries of Colorado. A dispatch, dated October 21, from Washington, D. C., to the *Rocky Mountain News,* of Denver, Colo., says:

"Individuals, duly licensed, may pull teeth in Colorado but corporations may not. This is, in effect, the stand of the U. S. Supreme Court in upholding today the action of the attorney general of Colorado in barring Painless Parker Dentists, a California corporation, from practicing dentistry within the state. Parker carried the case to the high court on an appeal for review of the decision of the Colorado supreme court, which banned his system on the ground corporations cannot be licensed in a profession catering to public health. The U. S. high tribunal today declined to review the decision. The defendants claimed they employed only qualified and licensed dentists. The state, however, held the laws of Colorado authorize issuing of permits to practice dentistry to individuals only. Parker also contended his company had the right to own and operate dental offices in which his agents, who were licensed dentists, could practice. The state's action in disbarring the company, the corporation claimed, constituted a violation of the constitutional rights of private business."

Postgraduate Meeting of Tristate Dental Clinic: The Postgraduate Meeting of the Tri-State Dental Clinic, Tenth Annual Session, was held in Memphis, Tenn., November 18-20. Tennessee, Mississippi and Arkansas are represented in this organization, of which J. N. C. Moffat, Clarksdale, Miss., is president. The following lecturers and clinicians took part in the program: Boyd S. Gardner, Rochester, Minn.; Percy R. Howe, Boston, Mass.; T. V. Maves, Cleveland, Ohio; Frederick R. Molt, Chicago, Ill.; W. J. Charters, Des Moines, Iowa; R. Boyd Bogle, Nashville, Tenn.; Louie T. Austin, Rochester, Minn.; C. W. Hoffer, Nashville, Tenn.; John J. Shea, Memphis, Tenn., and Mr. W. O. Mussey, Jr., Denver, Colo.

Viscount Aguilar Honored: Viscount Florestan Aguilar, of Madrid, Spain, dean of the dental school of the University of Madrid, and editor of *La Odontalgia,* president of the International Dental Federation, who, with Lady Aguilar, attended the Annual Session of the American Dental Association and spent some time thereafter in Chicago and other dental centers, has been given an honorary membership in the American College of Surgeons. At a dinner given in his honor by the faculty of the Chicago College of Dental Surgery, Viscount Aguilar related the plans for a "university city" for the new royal University of Madrid, which is to cost $53,000,000. As evidence of the rising interest in football and other modern sports, a stadium seating 60,000 is to be built.

Dental Statistics: In recent years, the importance of dentistry and oral hygiene to general health has been more widely recognized. Dentists have increased rapidly since 1900, there being over 67,000 in the United States at present. They are unevenly distributed over the country—some urban centers have one dentist to every 500 people, while some rural communities have only one dentist to every 4,000 people. Likewise the supply varies considerably from state to state; the extremes for 1928 were California with 103 dentists and Mississippi with 19 dentists per 100,000 population. There has been considerable division of labor in the field of dentistry. This has taken the form of specialization among the dentists themselves and the development of such occupational groups as dental hygienists and dental technicians.—Committee on the Cost of Medical Care.

DEATHS

Moriarty, Patrick W., Boston, Mass.; Harvard University Dental School, 1899; died suddenly, August 16; aged 68.

Lappen, George Holland, Boston, Mass.; Harvard University Dental School, 1913; died, July 16, of angina pectoris; aged 44.

Nolan, Joseph P. A., Pawtucket, R. I.; Baltimore College of Dental Surgery, 1904; died suddenly, July 13; aged 46.

Mitchell, Vethake E., New York City; School of Dentistry, University of Pennsylvania, 1892; died, October 4; aged 58.

Perkins, Robert S., Chicago, Ill.; Chicago College of Dental urgery, 1893; was killed by an automobile, November 1; aged 55.

Karamanos, A. K., Chicago, Ill.; Chicago College of Dental Surgery, 1913; died, August 13.

Moorhead, William W., Aledo, Ill.; University of Iowa College of Dentistry, 1891; died, Augst 14; aged 62.

Peck, A. H., Joliet, Ill.; Chicago College of Dental Surgery, 1888; died, November 6, after a year's illness; aged 67. Dr. Peck was also a graduate of the Rush Medical College. For two years, he occupied the chair of dental materia medica and therapeutics

in the Chicago College of Dental Surgery; and for five years, he held a similar position at the Northwestern University Dental School. In 1901, he resigned to accept the deanship of the dental department of the University of Illinois, a position which he held for three years. Dr. Peck had served as president of the Chicago Dental Society, the Illinois state society and the national association. He was in active practice in Chicago until August, 1928, when he was forced to retire because of ill health.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Denver, Colo., July, 1930.

American Dental Society of Europe, Nice, France, April 21, 1930.

Australian Dental Association, Brisbane, July 7-12, 1930.

Dental Protective Association of the United States, Chicago, Ill., Dec. 16, 1929.

International Dental Federation, Paris, France, August, 1931.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

January (1930)

Pennsylvania (Midwinter), at Harrisburg (30-31).

April (1930)

Alabama, at Montgomery (15-17).
Connecticut, at Stamford (22-24).
New Jersey, at Asbury Park (April 30-May 2).

May (1930)

Massachusetts, at Boston (5-9).
New York, at New York City (12-16).
North Carolina, at Asheville (5-8).
Pennsylvania, at Philadelphia (6-8).
Tennessee, at Nashville (13-15).

Central Pennsylvania Dental Society, Altoona, Feb. 26-28, 1930.

Chicago Dental Society, Midwinter Clinic, Jan. 13-15, 1930.

Dallas Midwinter Dental Clinic, Feb. 10-12, 1930.

First District Dental Society of New York, Dec. 10-14, 1929.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Michigan, at Ann Arbor, January 6-11. J. W. Lyons, Secretary, 617 Dwight Bldg., Jackson.

Minnesota, at Minneapolis, December 13. F. E. Cobb, Secretary, 601 Donaldson Bldg., Minneapolis.

New Jersey, at Trenton, December 2-7. John C. Forsyth, Secretary, 148 W. State St., Trenton.

North Dakota, at Fargo, January 14-17. Gilbert Moskau, Secretary, Grand Forks.

Oklahoma, at Oklahoma City, January 6-9. E. E. Sanger, Secretary, Yukon.

Pennsylvania, at Philadelphia and Pittsburgh, December 4-7. Alexander H. Reynolds, Secretary, 4630 Chester Ave., Philadelphia.

Rhode Island, at Providence, December 3-5. Albert L. Midgley, Secretary, 1108 Union Trust Bldg., Providence.

OKLAHOMA STATE BOARD OF DENTAL EXAMINERS

The next examination of the Oklahoma State Board of Dental Examiners will be held in Oklahoma City, January 6-9. Address all correspondence to

E. E. SANGER, *Secretary*,
Yukon.

NORTH PHILADELPHIA ASSOCIATION OF DENTAL SURGEONS

The North Philadelphia Association of Dental Surgeons will hold a meeting January

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

8, at the Majestic Hotel, in honor of the completion of its twentieth year. There will be clinics and entertainment, to which all dental practitioners are invited. Details will be given later.

VICTOR H. FRANK, *President*

DALLAS MIDWINTER DENTAL CLINIC

The Dallas Midwinter Dental Clinic will be held, February 10-12. The clinicians are as follows: George M. Hollenbeck, Los Angeles, crowns and bridgework; R. O. Schlosser, Chicago, prosthetics; Thomas P. Hinman, oral surgery; W. J. Charters, Des Moines, periodontia.

BROOKS BELL, JR., *Secretary,*
1810 Medical Arts Bldg.,
Dallas.

TENNESSEE STATE DENTAL ASSOCIATION

The Tennessee State Dental Association will meet in Nashville, May 13-15.

R. P. ROSS, *Sec'y-Treas.,*
Kingsport.

MASSACHUSETTS DENTAL SOCIETY

The next annual meeting of the Massachusetts Dental Society will be held at the Copley Plaza, Boston, May 5-9.

THOMAS K. ROSS, *President,*
280 Main St.,
Fitchburg.

PHILIP E. ADAMS, *Secretary,*
236 Newbury St.,
Boston.

CENTRAL PENNSYLVANIA DENTAL SOCIETY

The twenty-eighth annual meeting of the Central Pennsylvania Dental Society will be held in Altoona, February 26-28, at the Penn Alto Hotel.

R. L. MCKIM, *President,*
Osceola Mills.

J. G. SHAFFER, *Chairman,*
Local Arrangements Committee,
1200 14th Ave., Altoona.

F. D. I. PRIZE COMPETITION

According to the order of the president of the scientific commission, Bernhard Gottlieb, of Vienna, a resolution was passed at the annual meeting of the F. D. I., to decide on further clarification of methods of proof of root canal treatment which can be depended on. To this end, it has been decided to postpone the date of the contest until after the date of the international congress at Paris in 1931. Several authorities on this subject will be invited to report on this question, and, on the basis of these reports, a definite control method and a definite date of the prize contest will be decided on.

ALABAMA DENTAL ASSOCIATION

The Alabama Dental Association will hold its sixty-first annual meeting in Montgomery, April 15-17.

F. F. PERRY, *Secretary,*
Montgomery.

THE NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The North Dakota State Board of Dental Examiners will hold its next meeting at Fargo, January 14-17. Applications for examination must be in the hands of the secretary by January 4.

GILBERT MOSKAU, *Secretary,*
Grand Forks.

AUSTRALIAN DENTAL ASSOCIATION

The 1930 Congress of the Australian Dental Association will be held at Brisbane, July 7-12. This is the seventh triennial congress of the profession in Australia. Overseas practitioners may subscribe to the congress provided they conform to the requirements of an ethical society in the country where they practice. The fee for such members will be two guineas (about $10). The proceedings of the congress will be published in book form, a copy of which will be available for each member. Numerous social functions are being arranged and excursions to local sugar and fruit districts and beaches, and the congress golf and tennis tournaments will be held.

W. R. PARKER, *President,*
Edward St.,
Brisbane.

NEW JERSEY STATE DENTAL SOCIETY

The sixtieth annual meeting of the New Jersey State Dental Society will be held in the Berkeley-Carteret Hotel, Asbury Park, April 30-May 2. Exhibitors will please address E. C. Stillwell, Arcade Bldg., Glen Ridge. For general information, address

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton.

INTERNATIONAL DENTAL FEDERATION

The eighth congress of the International Dental Federation will be held in Paris, France, in August, 1931.

AMERICAN FULL DENTURE SOCIETY

The American Full Denture Society was organized at Minneapolis last year. It has just closed its first annual meeting with a scientific program and the adoption of a constitution and bylaws which provides, among other things, for admission to membership of all members in good standing of the American Dental Association. It is the purpose of this society to carry on research work in this particular field, the results of which are to be brought, at intervals, before the profession. The code of ethics of the A. D. A. is adopted as the code of ethics of this society. The charter membership is made up of men from twenty-seven states, including representatives from the teaching staffs of fifteen leading colleges. Since membership in this society is open to all members of the American Dental Association, the officers are asking that this information be given in the form of an announcement in THE JOURNAL, that those who are especially interested in this field, may take steps to identify themselves with this society. Officers elected for the ensuing year are: president, Ralph L. Christy, 820 Majestic Bldg., Denver, Colo.; secretary, Emory O. West, 608 Equitable Bldg., Des Moines, Iowa.

CHICAGO DENTAL SOCIETY SIXTY-SIXTH ANNUAL MEETING AND CLINIC

January 13-15, 1930

The Chicago Dental Society wishes to announce the 1930 annual meeting and clinic at the Stevens Hotel. Full provision will be made for the comfort of all those in attendance. The experience of conducting the 1929 meeting at the Stevens has provided a basis for conducting the next meeting, which without a doubt will reflect in a substantial measure the increasing importance of this annual event.

All members of the American Dental Association are cordially invited to attend. Preliminary programs will be mailed to all members of the A. D. A. some time in December of this year. The program will be divided into eight sections as follows:

Section I—OPERATIVE DENTISTRY
Chairman: Frank G. Conklin, 4010 West Madison St.
Vice-Chairman: A. E. Schneider, 25 East Washington St.

Section II—FULL DENTURES
Chairman: E. C. Pendleton, 916 Galt Ave.
Vice-Chairman: S. A. Hutt, 3166 Lincoln Ave.

Section III—PARTIAL DENTURES; CROWN AND BRIDGE
Chairman: W. I. McNeil, 59 E. Madison St.
Vice-Chairman: R. A. Jentzsch, 185 N. Wabash Ave.

Section IV—ORAL PATHOLOGY, HISTOLOGY, BACTERIOLOGY AND CHEMISTRY
Chairman: J. R. Blayney, 2209 Rosemont Ave.
Vice-Chairman: W. G. Skillen, 311 East Chicago Ave.

Section V—MOUTH HYGIENE AND PUBLIC HEALTH
Chairman: Lon W. Morrey, 4235 N. Hermitage Ave.
Vice-Chairman: Corvin F. Stine, 1319½ Estes Ave.

ection VI—ORTHODONTIA
Chairman: Abram Hoffman, 311 E. Chicago Ave.
Vice-Chairman: Harris W. McClain, 55 E. Washington St.

Section VII—ORAL SURGERY AND RADIOGRAPHY
Chairman: Roscoe L. Stout, 55 E. Washington St.
Vice-Chairman: Joseph G. Wiedder, 25 E. Washington St.

Section VIII—DENTAL ECONOMICS
Chairman: Harold S. Smith, 180 N. Michigan Ave.
Vice-Chairman: F. van Minden, 185 N. Wabash Ave.

The program committee is under the direction of Stanley D. Tylman, assisted by Henry C. Lee, E. C. Pendleton and Roscoe L. Stout.

The manufacturers and dealers exhibits will be held in the spacious exhibit hall, one flight down from the main floor. All applications for exhibit space should be directed to C. Davidson, Chairman Exhibit Committee, 55 E. Washington St.

HUGO G. FISHER, *President,*
HOWARD C. MILLER, *Secretary,*
55 E. Washington St.

PACKAGE LIBRARIES*

Compiled by and Available for Circulation
from

THE LIBRARY BUREAU

American Dental Association
58 E. Washington St., Chicago, Ill.

Absorption of roots and bone.
Alveolectomy.
Amalgam fillings and physical properties of amalgam.
†Anesthetics in children's dentistry.
Apicoectomy.
Articulation, occlusion and mandibular movements.
†Bacteriology.
Best time for orthodontic treatment.
†Blood count in focal infection.
†Bridges using inlays as abutments.
Business side of dentistry.
Cancer of mouth.
Cast gold inlays.
Casting gold, including inlays and dentures.
Cavity preparation.
†Child psychology.
Children's dentistry.
Cleft lip and palate.
Community and school dental service.
Comparative dental anatomy.
Condyle path movements.
†Contraindications for and untoward results from the use of local anesthetics.
†Contributions dentists have made outside their profession.
†Curetting.
Cysts.
†Deciduous teeth and their relation to permanent dentition.
Dental assistants.
†Dental care of the preschool child.
Dental caries.
†Dental cements.
Dental clinics.
†Dental disease and practice in the tropics.
Dental economics.

*Each package library contains information on one of the subjects listed and is composed of reprints, magazine clippings, etc., on that subject only. The packages may be borrowed by members of the Association for a period of one week after date of receipt; and if they are not reserved for some one else, the period will be extended on request. The rental fee for borrowing a package library is fifty cents. This should accompany the request for the package. No packages are sold. In response to requests, packages will be compiled on other subjects pertaining to dentistry.

†These packages contain less than the usual number of articles.

†Dental erosion.
Dental ethics.
Dental hygienists.
†Dental nomenclature.
Dental health education.
Dentifrices.
Dentistry as a career and the status of the dentist.
Denture casting.
Diet and nutrition in relation to teeth.
Diet in pregnancy.
†Dry socket.
†Education of denture patients.
Endocrine glands in relation to teeth.
Eruption of teeth and accompanying symptoms.
Esthetics in denture construction.
†Ethyl chlorid.
Ethylene anesthesia.
Etiology of caries.
Etiology of malocclusion and preventive orthodontia.
†Etiology of pyorrhea and its relation to systemic conditions.
Evolution of human dentition.
Examination of the mouth and oral diagnosis.
Extraction of teeth.
First permanent molars.
Fixed and removable bridgework.
Focal infection.
Focal infection in relation to diseases of the eye.
Foreign bodies (of dental origin) in the lungs and esophagus.
Fractures of the jaws.
Full denture construction.
Gold foil.
Habits as factors in malocclusion.
†Hemophilia or excessive hemorrhage following extraction.
Hereditary influences in malocclusion.
†High frequency in dentistry.
†Histologic examinations of fractured roots.
†Histologic study of teeth and tissues.
History and progress of dentistry.
History of dentistry.
Hospital dental service.
Impacted teeth and their removal.
Impacted third molars.
Impression technic.
Impressions for inlays.
Indirect inlay technic.
Industrial dental service.
†Infection following extraction of teeth.
Influence of deciduous teeth and first permanent molars on occlusion.
†Influence of diet on saliva.
Interpretation of roentgenograms.
Ionic medication.
Lectures to nurses.
Local anesthesia.
†Ludwig's angina.
Mandibular movements.

Materia medica and pharmacology.
Maxillary sinus and antrum—diseases and treatment.
Mouth hygiene.
Muscle exercises and training in orthodontia.
Nitrous oxid-oxygen anesthesia.
Oral diagnosis.
Oral diagnosis with reference to roentgen ray.
Oral manifestations of systemic conditions.
Organized dentistry.
Orthodontia and its relation to dentistry and medicine.
Orthodontic appliances.
Orthodontic education.
Osteomyelitis of the jaws.
Partial dentures.
†Permeability of tooth structures.
Physical therapy in dentistry.
†Pinledge and pinlay attachments.
Place of extraction in orthodontia.
Porcelain.
Porcelain inlays.
Porcelain jacket crowns.
Postoperative care of dental patients.
Postoperative complications and care.
†Postoperative psychosis.
†Pregnancy and dental disease.
Preoperative examination of patients.
†Preparation of cavities with hypersensitive dentin.
Preventive orthodontia.
Procain (novocain) dermatitis.
†Program building for state and district societies.
Prophylactic odontotomy.
Pulp conservation.
†Pulp nodules.
Pyorrhea.
Relation between dental conditions and mental health of insane.
†Retrusion of the mandible causing impaired hearing.
Root canal treatment.
School dental service.
Sterilization of dental instruments.
Stomatology.
Studies of saliva.
Suggestions for a talk to mothers.
Surgical treatment of pyorrhea.
Synthetic fillings.
Tooth arrangement for full dentures.
Toothbrushes and toothbrush containers.
Toothbrushes, tooth pastes and mouth washes.
Traumatic occlusion.
Trigeminal neuralgia.
†Tuberculosis and dentistry.
Ultraviolet ray in the treatment of pyorrhea.
Ultraviolet ray therapy in dentistry.
Use of elevators in extraction.
Value of dental service in schools.
Vincent's infection.

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1929-1930

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The Use of Soap and Chalk in Dentifrices

"NEW WAY TO WHITEN TEETH WITHOUT INJURY TO THE ENAMEL"

WHAT KOLYNOS SAYS TO THE PUBLIC

No. 4

"The Kolynos formula contains an ingredient which makes it whip instantly into a snowy foam in the mouth.

"'Yellow' teeth or dull, discolored teeth are only teeth coated with a mucin that forms in the mouth and absorbs stains from foods, drinks and tobacco. The active, antiseptic Kolynos foam covers the teeth and disintegrates the mucoid deposit and with the aid of a properly stiff tooth brush, washes it completely off the teeth. Teeth are cleaned down to the gleaming, white naked enamel without injury."

"The most important ingredient in a dentifrice is soap" states Dr. A. C. Fones leader of the Oral Hygiene movement. From experiments made by other noted leaders in the dental profession it is apparent that the dental opinion is in favor of alkaline dentifrices.

Dr. N. S. Jenkins, after innumerable tests of the Kolynos formula over a period of fifteen years, established the fact that Kolynos, a soap-containing dentifrice, loosens and dissolves the bacterial plaque, neutralizes the acid formed by mouth bacteria and checks the decalcification of enamel.

Further tests, which have been substantiated by recent bacteriological investigations, show a marked reduction of mouth bacteria with each brushing of the teeth with Kolynos.

Kolynos Dental Cream is antiseptic, mildly alkaline sufficient to dissolve the mucin plaque and neutralize the acids formed by mouth bacteria, and contains a refined precipitated chalk which polishes the enamel without danger of abrasion.

May we send you a Professional package?

THE KOLYNOS COMPANY
NEW HAVEN CONNECTICUT

What can a TOOTHPASTE *say to a* DENTIST?

A LOT . . .
if what it says is true!

"Every dentist knows what a dentifrice will and will not do.

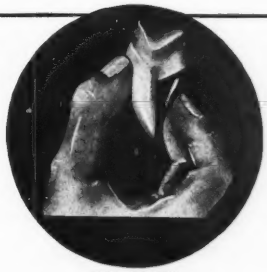
". . . Dentists know that no dentifrice can *cure* pyorrhea.

". . . That no dentifrice has ever yet corrected mouth acidity for a long enough period to prevent decay.

". . . Nor has any dentifrice been so far perfected that it will firm the gums."

Colgate's, by producing a toothpaste whose one and only claim is to keep teeth clean . . . has concentrated on an essential truth that is familiar to every dentist . . . a truth that still furthers his efforts in protecting teeth and gums . . . a *vital* truth that promotes the cause of oral hygiene.

No dentifrice can cure pyorrhea. No dentifrice can correct mouth acidity for a long enough period to prevent decay. No dentifrice can firm the gums. Every dentist knows these facts.



PAT. PENDING

Porcelain —

most kind to tissue

A PORCELAIN contact with gum tissue assures freedom from salivary deposits, harbors for food and micro-organisms, tissue irritation and tainted breath.

Try the new Trupontic for anterior and the Sanitarypontic for posterior cases.

Strelr's

TRUPONTIC

AND

SANITARY-PONTIC

ACCURATELY INTERCHANGEABLE

CERAMIC ART'S GREATEST CONTRIBUTION to DENTISTRY

THE COLUMBUS DENTAL MFG. CO., Columbus, Ohio, U.S.A.

JUSTI TEETH

have given satisfaction for sixty-five years.

JUSTI PORCELAIN

is unexcelled for strength and popularity of shades.

JUSTI MOLDS

as presented in the Ekloform and Pinoro lines are in keeping with the most exacting requirements of prosthodontists.

Add to this the **Justi** policy of investigating the merits of new tooth forms—such as Hall's Inverted Cusp Posteriors and Sear's Channel Posteriors—and being the only manufacturer to offer them to the profession.

Then you have some good reasons for becoming a **Justi** customer.

H. D. JUSTI & SON
PHILADELPHIA

Doctor:

How do you match those pink tints in your patients' teeth?

ONE of the most difficult problems in connection with Synthetic Porcelain was to develop a pink porcelain pigment. Other manufacturers have tried to make a pink shade but they have used pigments, like vermilion, which bleach out or discolor badly. The Caulk Research Laboratories developed a pink porcelain pigment for Synthetic Porcelain Shade No. 11, a very necessary shade because many teeth show decided traces of pink. At this time other manufacturers of silicates do not make a pink shade or else the pink shade is a colored pigment not resistant to chemical change. Synthetic Porcelain is the only product now sold in which a pink porcelain pigment is used and it is all produced in the Caulk Dental laboratories at Milford.

"That Synthetic Porcelain Smile"

CAULK

THE SILENT SALESMAN
Every American Cabinet is a silent, tactful salesman. By the psychological effect of its beauty and professional appearance, upon the dentist's clientele, it impresses them with his judgment, skill and professional success.
American Console Dental Cabinet No. 150 is shown above in white Duco, with black vitrolite working surface, black glass knobs and black striping. Also furnished in Cadet Blue, Neptune Green, Mother of Pearl Gray, and Black Duco.
THE AMERICAN CABINET CO.
TWO RIVERS, WIS.

Note: We are now prepared to supply cabinet bases in the new material "Formica," in Verde Antique pattern, at the same price as marble.

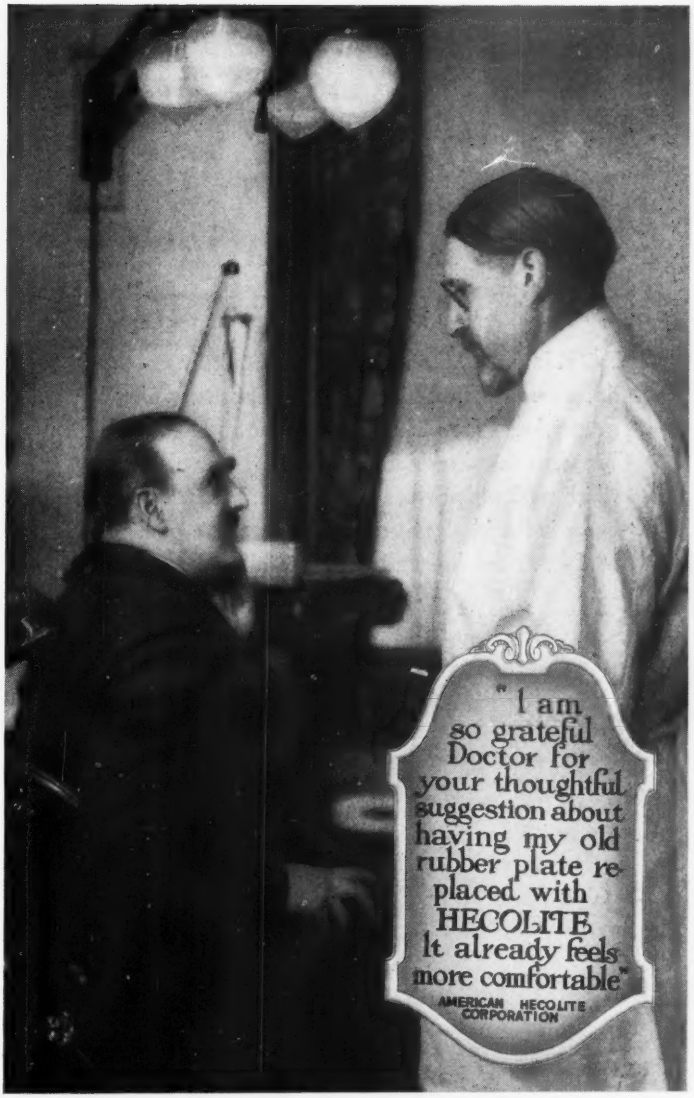
THE AMERICAN CABINET CO., Two Rivers, Wis.

Please send me catalog No. 19-C.

Name.....

Address.....

City.....State.....


"I am so grateful Doctor for your thoughtful suggestion about having my old rubber plate replaced with HECOLITE It already feels more comfortable"
AMERICAN HECOLITE CORPORATION

The new de luxe edition of the

THREE HECOLITE KEY BOOKS

is ready. Send for your copy today.

AMERICAN HECOLITE CORPORATION

94 E. 6th Street Dep't 14 PORTLAND, ORE

IMPROVED STONE

Quicker-Setting

Takes Uncertainties Out of Prosthetic Operations

R & R Improved Stone absorbs water quickly and produces a mix of smooth, putty-like consistency, that is *not sticky*. It sets rapidly into a pure white marble-like cast that has high resistance to pressure, from which teeth will not break off or scale. These qualities make it the ideal material for casts and orthodontic models. Your dealer can supply it in "trial size" cans.

100-lb. Drums $13.50 **12½-lb. Tins $3.00**
4½-lb. Tins $1.50

The Ransom & Randolph *Company*
TOLEDO — OHIO

Your Patients need Brushing Advice

A RECENT SURVEY revealed the fact that, of those who brush their teeth regularly, the majority do so but once a day—in the morning. The explanation is that upon arising we feel the greatest need for mouth cleanliness. Though morning brushing is advisable and to be encouraged, it is at night, if the mouth is left unclean, that the products of decomposition accumulate. It is then that the food particles which have lodged in the tiny crevices and between the teeth decompose and form acids, doing the greatest damage to the teeth. It is during the hours from dusk to dawn that the inactivity of the mouth glands makes the mouth an excellent breeding field for destructive bacteria.

Dentists, who recognize the trust their patients place in them, recommend only a product which they feel can be used with the greatest effect. The superiority of Squibb's Dental Cream has long been recognized. It contains over 50% of Squibb's Milk of Magnesia. Its use, therefore, before retiring not only cleans the teeth safely (for it is free from irritating substances) but it leaves tiny particles of Milk of Magnesia in the pits and crevices of the teeth to combat the acids of decay during the night. It should be used both morning and night.

We shall be glad to send you a complimentary package of SQUIBB'S DENTAL CREAM *for your personal use. It is sent only upon request. Just send your professional card to* E. R. SQUIBB & SONS, 80 BEEKMAN STREET, NEW YORK CITY.

SQUIBB'S DENTAL CREAM

More Than One Cavity In Many Baby Teeth!

"Many children 3 and 4 years of age have been found with twenty-four cavities in their twenty baby teeth," says Dr. Charles H. Henshaw in the Journal of the A. D. A., July, 1929

MARKED dental caries at this early age often indicates a lack of one vital factor—Vitamin D.

Vitamin D is the important calcifying factor which helps children build strong sound teeth and which offers protection against decay.

A continued deficiency of Vitamin D may result in poor teeth and health *all through life.*

There are two common sources of Vitamin D—sunshine and *good* cod-liver oil.

But modern conditions of living, particularly during the winter months, make it almost impossible to receive enough direct sunlight for protection!

"Bottled Sunshine—cod-liver oil—is the assured source of supply.

Remind mothers who have young children to give them cod-liver oil regularly. When you mention cod-liver oil to mothers, be sure to specify Squibb's for its special richness in Vitamins A and D. Squibb's Cod-Liver Oil is guaranteed and tested for its vitamin content. It is refined under conditions which protect its potency. On sale at all good drug stores.

Two New Squibb Products

VIOSTEROL SQUIBB—a new concentrated source of Vitamin D—*100 times* as potent as standard cod-liver oil.

SQUIBB'S VIOSTEROL COD-LIVER OIL 5 D—abundant in Vitamin A and *five times* as rich in Vitamin D as standard cod-liver oil. Plain and Mint-flavored.

These new irradiated ergosterol products are prescribed for cases which require *special* amounts of Vitamin D. They are licensed by the Wisconsin Alumni Research Foundation and approved by Council of Pharmacy and Chemistry, A. M. A.

SQUIBB'S COD-LIVER OIL

VITAMIN TESTED — PLAIN OR MINT-FLAVORED — VITAMIN PROTECTED

Produced, Tested and Guaranteed by E. R. Squibb & Sons, New York
Manufacturing Chemists to the Medical Profession since 1858

A Proven Success—Supplee's

Dentures with "CAST-IN" Wire Clasps

COMBINING WIRE CLASPS and Platinized Gold in a one-piece casting means an unquestioned "Better Denture." Let us construct our "Cast-In" Wire Clasp Denture on your next case. You, too, will be pleased with the results. It serves two important purposes—

USE SUPPLEE DENTURSCOPE SERVICE

Submit articulated study models and let us send you a "Denturgraf" designed in actual color for presentation to your patient in our "Denturscope" which reveals design but conceals price and technical data.

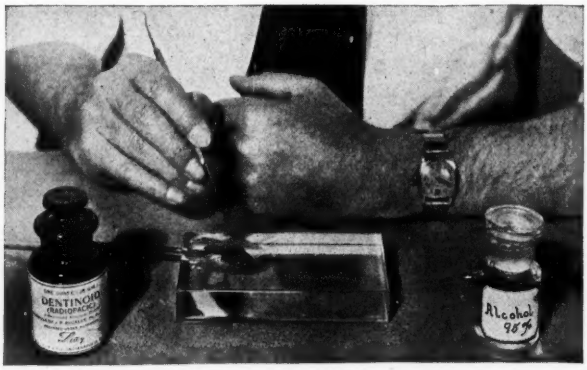
It gives the close fit, strength and adaptation of the one-piece casting; it incorporates the advantages of resiliency and adjustability of wrought wire clasps —fashioned by our skilled "wire benders"— which, through our "Cast-In" technic, becomes an integral part of the casting.

A copy of our Brochure "Meeting the Needs of Dentistry" awaits your request.

SAM'L G. SUPPLEE & CO.

17-19 UNION SQUARE NEW YORK, N. Y.

PHONES: ALGONQUIN 7470-1-2-3-4-5-6-7



Mixed Dentinoid ready to be carried to the cavity.

DENTINOID, LILLY

DENTINOID is a medicated, artificial dentin for protecting the dental pulp and filling the canals of pulpless teeth. It protects the pulp in deep-seated cavities, sterilizes the dentin beneath which it is applied, and encourages the deposition of secondary dentin by stimulating the odontoblastic layer of cells. Supplied in 1-ounce glass-stoppered bottles.

FORMOCRESOL LILLY

This combination of formaldehyde and cresol is a specific for gangrenous pulps, and uncomplicated dental granulomas and alveolar abscesses. Supplied in 1-ounce glass-stoppered bottles.

PYORRHEA ASTRINGENT, LILLY

Pyorrhea Astringent is an almost ideal disinfectant for live animal tissue. It should be used after surgical and prophylactic treatment of periodontoclasia. Supplied in 1-ounce glass-stoppered bottles.

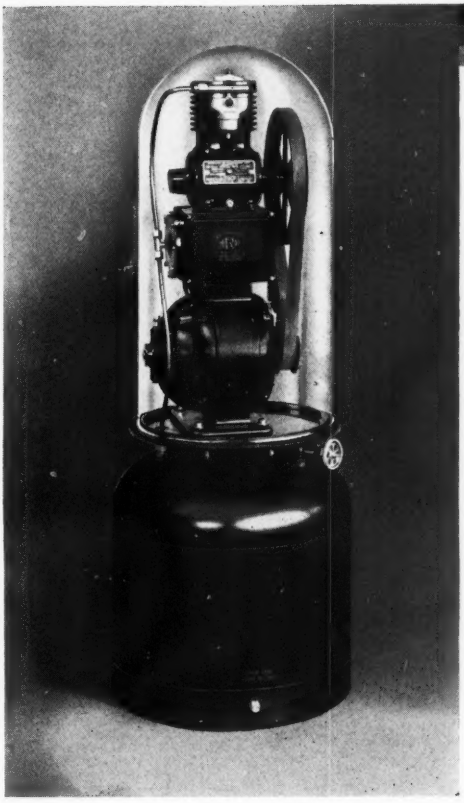
SEND FOR PAMPHLET

Order Through Your Customary Source of Supply.

All Lilly Dental Preparations Are Made After The Formulas of J. P. Buckley, Ph. G., D. D. S.

ELI LILLY AND COMPANY

INDIANAPOLIS, U. S. A.



THE RITTER twin-cylinder COMPRESSOR

COMPRESSED air . . . free from dust and impurities . . . clean, filtered, pure and aseptic . . . is instantly available when you use a Ritter Twin-Cylinder Compressor.

Quick . . . quiet . . . dependable . . . efficient . . . automatic . . . durable, the Ritter Compressor supplies compressed air when you need it. It is absolutely dustproof because all working parts are enclosed—proper pressure is constantly maintained by a quick and positive acting automatic switch—precisely fitted moving parts and a splash lubricating system provide practically noiseless operation.

For complete information see your Ritter dealer or write today to Ritter Dental Mfg. Co., Inc., Rochester, N. Y.

RITTER

HEXYLRESORCINOL SOLUTION S. T. 37

*In a published article * on Hexylresorcinol in Oral Antisepsis, Drs. Feirer and Leonard state—*

"SOLUTION S. T. 37 completely destroys all the usual pathogenic bacteria in less than fifteen seconds at body temperature. Spirochetes, amebae and flagellates disintegrate and disappear completely in less than five seconds on contact with this solution at body temperature.

"In spite of the difficulties involved, application of Solution S. T. 37 results in practically complete disinfection of the gum margin in five minutes."

Hundreds of reports from dentists in all parts of the country indicate that these laboratory results are daily finding practical expression in the clinical field.

A trial package on request.

3 ounce and 12 ounce bottles.

SHARP & DOHME
BALTIMORE

New York Chicago New Orleans St. Louis Philadelphia
Atlanta Kansas City San Francisco Boston Dallas

* "Hexylresorcinol in Oral Antisepsis with Special Reference to Solution S. T. 37," Dental Cosmos for September 1927.

IN THE MIND OF YOUR PATIENT
THE EQUIPMENT
REFLECTS YOUR PROFESSIONAL STATUS

S. S. White Equipment Unit No. 6
and Diamond Chair No. 2

Each a fitting complement to the other, and together the most efficient operating equipment for your career

Finished in White, Black Japan, Mahogany and Color

Write for descriptive details

The S. S. White Dental Mfg. Co., 211 S. 12th St., Philadelphia

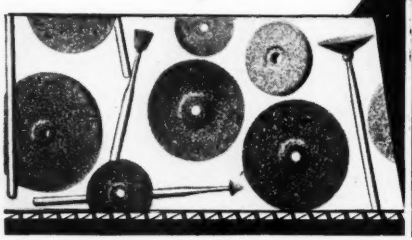
Ask for S. S. White

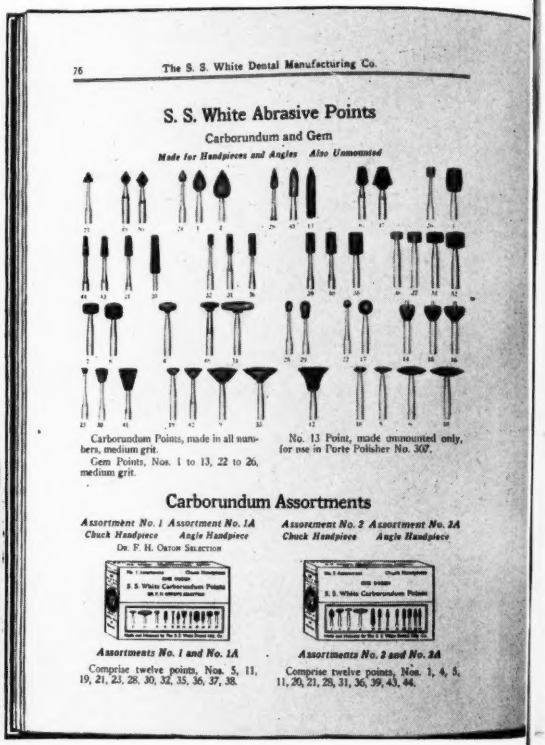
A moment's thought on abrasives will repay you in many ways. A good carborundum tool can save time for you; it can assist you to do better work. More important still, it can sustain your reputation as a gentle operator in the mind of the patient.

S. S. White Carborundum Points have made a distinct impression upon dentists who give any thought whatever to good cavity preparation and upon those who realize that careful mounting of their carborundum tools is an asset of no mean value. It's easy to tell when a carborundum tool is running true by the kind

S.S.White Carborundum

Points Wheels Disks





76 The S. S. White Dental Manufacturing Co.

S. S. White Abrasive Points

Carborundum and Gem

Made for Handpieces and Angles Also Unmounted

Carborundum Points, made in all numbers, medium grit.

Gem Points, Nos. 1 to 13, 22 to 26, medium grit.

No. 13 Point, made unmounted only, for use in Porte Polisher No. 307.

Carborundum Assortments

Assortment No. 1 Assortment No. 1A
Chuck Handpiece Angle Handpiece
Dr. F. H. Orton Selection

Assortment No. 2 Assortment No. 2A
Chuck Handpiece Angle Handpiece

Assortments No. 1 and No. 1A

Comprise twelve points, Nos. 5, 11, 19, 21, 23, 28, 30, 32, 35, 36, 37, 38.

Assortments No. 2 and No. 2A

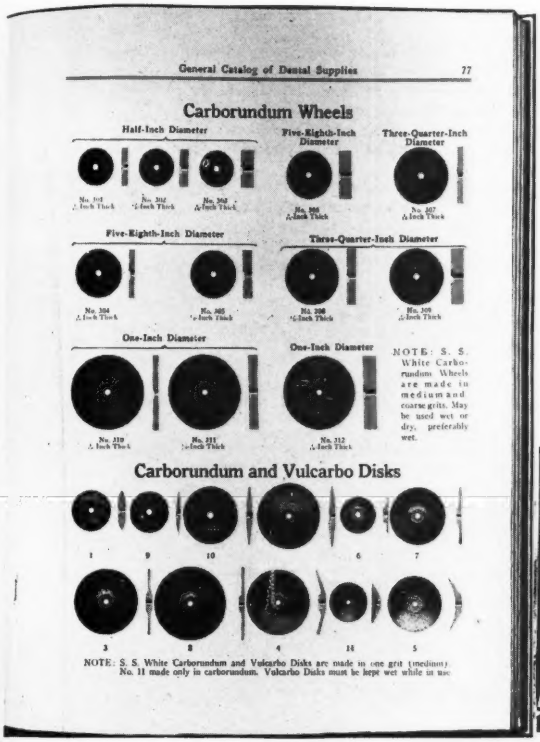
Comprise twelve points, Nos. 1, 4, 5, 11, 20, 21, 28, 31, 36, 39, 43, 44.

Carborundum Tools

of work it is doing, and the patient will give evidence too. Careful mounting in S. S. White Points means that they run true and are secure on the mandrels, and that the mandrels too are true and fit the handpiece accurately. Both mandrel and point are examined for true running.

The uniformity in the sizes and shapes in S. S. White "Carbo" Points inspires and aids a delicacy of touch for fine margin work and under cuts.

Like S. S. White Carborundum Wheels and Disks, the Points cut swift and clean; they wear even, and do not glaze.



General Catalog of Dental Supplies 77

Carborundum Wheels

Half-Inch Diameter — Five-Eighth-Inch Diameter — Three-Quarter-Inch Diameter

Five-Eighth-Inch Diameter — Three-Quarter-Inch Diameter

One-Inch Diameter — One-Inch Diameter

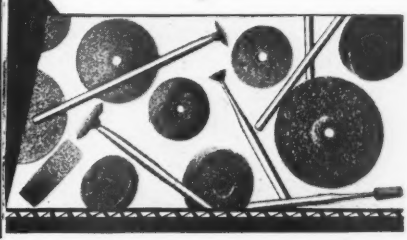
NOTE: S. S. White Carborundum Wheels are made in medium and coarse grits. May be used wet or dry, preferably wet.

Carborundum and Vulcarbo Disks

NOTE: S. S. White Carborundum and Vulcarbo Disks are made in one grit (medium). No. 11 made only in carborundum. Vulcarbo Disks must be kept wet while in use.

Swift Clean Cutters *for* Every Dental Need

for sale at your dealers



Save Them With
TRUE DENTALLOY

True Dentalloy will withstand a crushing strength far greater than that to which it will ever be subjected in the mouth. Of greater importance still, it has a resistance to flow, or the quality to hold its shape in spite of the constant hammer of occluding cusps.

True Dentalloy does not contract; for this reason it will never be the cause of a "ditch." After the initial set there is an infinitesimal expansion; thus True Dentalloy aids the work of a plugger. The expansion gives it a better adaptation to the cavity walls; microscopic spaces are sealed; then it sets, a strong, non-leaking filling with form that will remain unchanged forever—a filling with margins that may be trimmed to the hair line.

Millions of teeth in all parts of the world, subjected to all forms of diet, masticating habits, acids and condiments have been restored to their masticating efficiency with True Dentalloy.

Practitioners of the old school know it; men of today will do well to investigate before they choose an amalgam other than True Dentalloy.

True Dentalloy

For Fillings That Endure

Filings or Shavings—Medium or Quick Setting
Cut "A" for alloy-mercury proportioners
in medium setting only

1 oz. lot	Per oz. $2.40
5 oz. lot	Per oz. 2.25
10 oz. lot	Per oz. 2.10
20 oz. lot	Per oz. 2.00

For Sale by Dealers

The **S.S.White Dental Mfg. Co.**
211-17 South 12th Street
Philadelphia

Try It FREE

Mail coupon for complimentary bottle

CHECK the effectiveness of Swan-Myers Ephedrine Inhalant, No. 66, by the most convincing test of all—try it yourself *at our expense.* Learn how promptly, pleasantly, and completely this unusual new-type inhalant relieves the nasal congestion of colds and coryzas without the irritation and congestive reactions which sometimes follow the use of other solutions that contract capillaries. This relief may be expected to last for several hours. We'll gladly send you a complimentary bottle for your and your patients' use. Just sign the coupon and tear it out. Do it before you turn this page.

Accepted by Council on Pharmacy and Chemistry of the American Med. Assn.

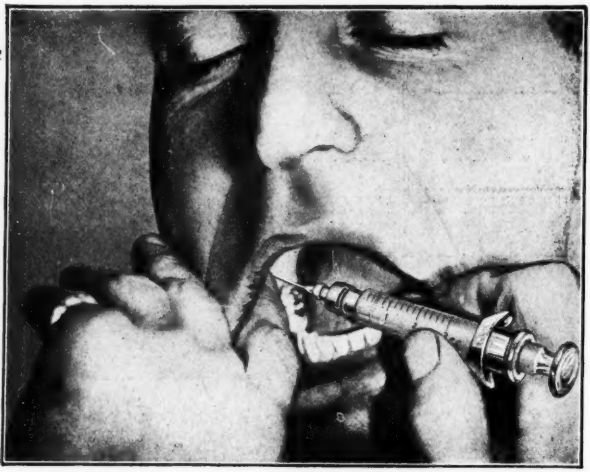
MAIL THIS COUPON

Swan-Myers EPHEDRINE Inhalant, No. 66

Swan-Myers Co., Indianapolis—Mail free trial bottle Swan-Myers Inhalant, No. 66, to

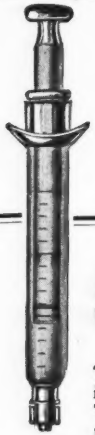
*Name*_____

*Address*_____



Performing the Mandibular injection with a Luer-Lok Posner Syringe and B-D Needle.

Luer-Lok Posner Syringe with resistance glass barrel and plunger, and Luer needle locking device.



Simple, Safe *and* Easy

The Luer-Lok Posner Syringe is light with a smooth fitting plunger to insure delicacy of manipulation, yet strong enough to meet every need. The clear glass barrel accurately calibrated with the scale baked into the glass, shows at a glance the quantity of solution and the rate of discharge.

B-D Needles are accurately hand honed and always fit; they can't jump off.

If you desire literature on the Luer-Lok Posner Syringe and Posner Technique kindly fill out and mail coupon.

Sold Through Dealers

B-D PRODUCTS

Made for the Profession

Makers of Luer-Lok and Sana-Lok Syringes, Aspto Syringes, B-D *Water Syringes, Dental Needles, Chip Blowers, Blood Pressure Instruments, and* B-D *Thermometers.*

BECTON DICKINSON & CO., Rutherford, N. J.
Gentlemen: I. D. XII

Please send literature on Luer-Lok-Posner Syringe and Posner Technique.

Name.....

Address.....

Dealer's Name.....

BECTON, DICKINSON & CO., RUTHERFORD, N. J.

Has Special Affinity *for* Mouth Acids

Pathogenic organisms will not thrive in an alkaline medium

Thomas C. Ely, writing in the Journal of the American Medical Association, 1918, LXXI, p. 1431, states that when the system is saturated with alkalies there is unfavorable soil for bacterial growth and resistance to infection is thereby maintained.

Gingival acidity, which results either from acid fermentation of retained food particles or as a result of gastric hyperacidity, is now recognized as a prime predisposing cause of dental erosion and decay, abscesses, pyorrhea, etc.

Phillips Milk of Magnesia is recognized as powerful antacid for use in the mouth. It is three times as effective as a saturated solution of bicarbonate of soda and fifty times as efficient as lime water but, in addition, Phillips Milk of Magnesia is presented as a colloidal suspension which, because of its colloidal character, has pronounced adhesive properties and mixes more intimately with the fluids of the mouth.

Phillips Milk of Magnesia has been regarded as the standard alkalizer for use in the mouth because, in addition to proving effective against mouth acids, it is non-irritating to mucous membranes and non-abrasive to tooth structure.

It acts immediately and efficiently, offers no disagreeable effects and provides the most practical method of preventing dental decay.

PHILLIPS Milk of Magnesia

In any course of treatment for combating acidity—the prime cause of dental caries—we recommend the use of Phillips Milk of Magnesia—internally to combat hyperacidity, locally as an alkaline mouth wash—in association with Phillips Dental Magnesia (a compound dentifrice).

CAUTION—The dentist is advised to beware of imitations. Phillips Milk of Magnesia supplied in 4-ounce and 12-ounce bottles. Phillips Dental Magnesia (a compound dentifrice) supplied in 2-ounce collapsible tubes. Obtainable from druggists everywhere.

"Milk of Magnesia" has been the U. S. Registered Trade Mark of The Charles H. Phillips Chemical Co. and its predecessor Charles H. Phillips, since 1875.

Prepared only by

The Charles H. Phillips Chemical Co., New York and London

TINKER No. 1
DOES NOT CHIP
WHEN DRESSED DOWN

IN castings where thin margins are important and the interdental relation is normal, Tinker Gold No. 1 is recommended. It casts clean with sharp margins and can be dressed down without flaking or cracking. It is remarkably free from pits and pickles beautifully

Tinker No. 1 is a lively gold with a pleasing inconspicuous color. It blends with the teeth and wears evenly.

In cases of severe occlusal stress or abnormal bite, Tinker No. 2 is indicated.

SPYCO SMELTING &
55 SOUTH THIRD STREET

ACCURATE
ASSAYING
OF YOUR
SCRAP

Through our accurate methods of assaying your scrap, both the platinum and palladium content are recovered as well as the gold and silver. Send your scrap to us or have your dealer send it. We will remit promptly in cash or in new precious metals as you prefer.

* * *

"Tinker Preparations,"—a copy of this booklet describing Dr. Tinker's Technique will be sent free if you will write us.

TINKER SERIES

TINKER GOLD No. 1—For full and ¾ jacket crowns and abutments. Price . . $1.55 dwt.

TINKER GOLD No. 1-H—Indicated for thin cast backings and thin ¾ crowns. Color similar to No. 1, harder and stronger. Price . . . . . $1.55 dwt.

TINKER GOLD No. 2—For lower incisors and upper ¾ crowns when a close bite is required in the thinnest type of attachment. (Pt-gold color) Price . . . . . $1.65 dwt.

TINKER GOLD No. 3—For strong thin cast clasp (very tough). Price . . $2.25 dwt.

TINKER GOLD No. 4—For large one-piece and assembled castings and clasps. Price . . . . . $1.50 dwt.

SPYCO SERIES

SPYCO SOFT INLAY—9½% softer than 22k plate for inlays only. Price . $1.20 dwt.

SPYCO HARD—40% harder than 22k plate for dummies, carmicheals and inlays, etc. (Contains Platinum) Price . . $1.20 dwt.

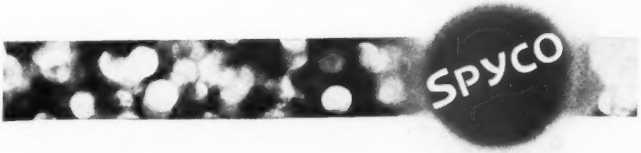
SPYCO No. 4 L. F.—For large cast dentures and clasps—high tensile strength. (Contains Platinum) Price . . . . . $1.25 dwt.

CLASP WIRES

CLASP WIRE No. 3—High fusing (platinum color). Price . . . . . $2.30 dwt.

CLASP WIRE No. 5—Medium fusing (gold color). Furnished in round, half round, beveled, etc., and plate. Price $1.50 dwt.

ORTHODONTIA WIRE and band material. Price . . . . . $2.75 dwt.



REFINING COMPANY
MINNEAPOLIS, MINNESOTA

Patient Types . . .

At the Threshold of Womanhood

Forbearance is called for and real understanding between the parent and the daughter.

It is the physician's duty to guide and manage the anxious daughter and the anxious mother during these alterative and eventful changes.

At this period elimination is important for both the girl and the boy. To assure bowel movement, Petrolagar is usually chosen by the physician. It encourages natural peristalsis without upsetting other functional activities.

Petrolagar, a palatable emulsion of 65% (by volume) pure mineral oil emulsified with agar-agar, has many advantages over plain mineral oil. It mixes easily with bowel content, supplying unabsorbable moisture and does not interfere with digestion.

Petrolagar

Petrolagar Laboratories, Inc.
536 Lake Shore Drive,
Chicago. Dept. AD-12

Gentlemen:—Send me copy of "HABIT TIME" (of bowel movement) and specimens of Petrolagar.

Dr. .....

Address .....

.....

For Added Convenience

A *New* Dental Package—*and* A *New* Film Dispenser

Insert the Cartridge—

Press the Plunger—

—and a film is at your finger tips

Eastman *Radia-Tized* Films are now available in *one gross boxes*. Each package of films is a convenient cartridge for the easy-loading .... practical .... x-ray resistant metal Film Dispenser.

The Dispenser holds one gross of *Radia-Tized* films. It attaches to the wall with four screws. A slight pressure on the plunger presents a film packet ready for use.

The film packets themselves embody improvements. The new white wrappers are clean .... sanitary .... have perfected corners....and a new type of water proofing. Available in Nitrate or *Safety* base *Radia-Tized* films only.

These Eastman products are sold by your dental dealer. The Eastman Dental X-ray Film Dispenser is priced at $6.00.

Eastman Kodak Company, 341 State Street, Rochester, N. Y.

Gentlemen:

I want to try your improved *Radia-Tized* film packet in my x-ray work. Please send me a free trial sample.

Name_____

Street and Number_____

City and State_____

Give Revelation a trial

. . . then *note* the *results*

IF you have not as yet tried Revelation Tooth Powder, we urge you to send for a trial can today. Many of the dentists who have given Revelation a fair trial were thoroughly convinced after seeing the results obtained through its use. We feel that you, too, will be perfectly satisfied and that you will even suggest Revelation's use to your patients.

Revelation Tooth Powder if used as directed will overcome fermentation at the gum margin as well as between the teeth, hence sensitiveness at the gingival margins of the gums is relieved and the gums are left in a firm and healthy condition and caries inhibited. Revelation does not contain glycerine because we believe glycerine is an irritant and may cause recession of the gums.

Many dentists are using Revelation as their own personal dentifrice and we are sure that you also will use Revelation regularly after noticing the results.

Send your card now for full size can of Revelation, without charge, for testing purposes. We are supplying small samples of Revelation Tooth Powder for dispensing purposes. Designate whether trial can, samples or both are desired.

Revelation *for* Teeth *and* Gums

Never in paste form

AUGUST E. DRUCKER CO. 2226 Bush St., San Francisco, Calif.

Why the Porcelain Trend is to

LOCHHEAD

WHEN nation-wide approval has compelled the establishment of six laboratories to take care of an ever-increasing number of practitioners, there must be something to it.

Possibly it is the superior knowledge of porcelain carving and fusing that Lochhead craftsmen possess . . .

Possibly it is the dependability of time and accuracy that assures every case accepted by Lochhead to turn out most satisfactorily . . .

Possibly it is the mouth to mouth commendation by discriminating dentists who want their fellow practitioners to enjoy this superior porcelain service . . .

. . . but no matter what the cause, the facts remain—today we are enjoying the largest patronage in the history of our organization.

Try Lochhead—then you, too, will know why.

The Lochhead Laboratories, Inc.

NEW YORK, N. Y.
115 W. 45th St.

CINCINNATI, OHIO
18-20 W. Seventh St.

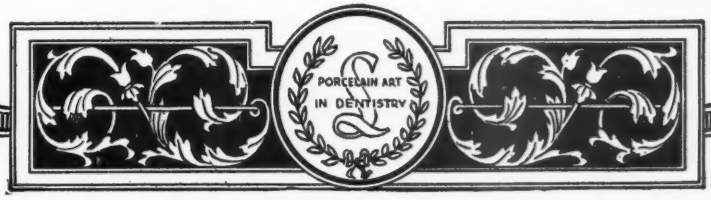
LOS ANGELES, CALIF.
512 Hillstreet Bldg.

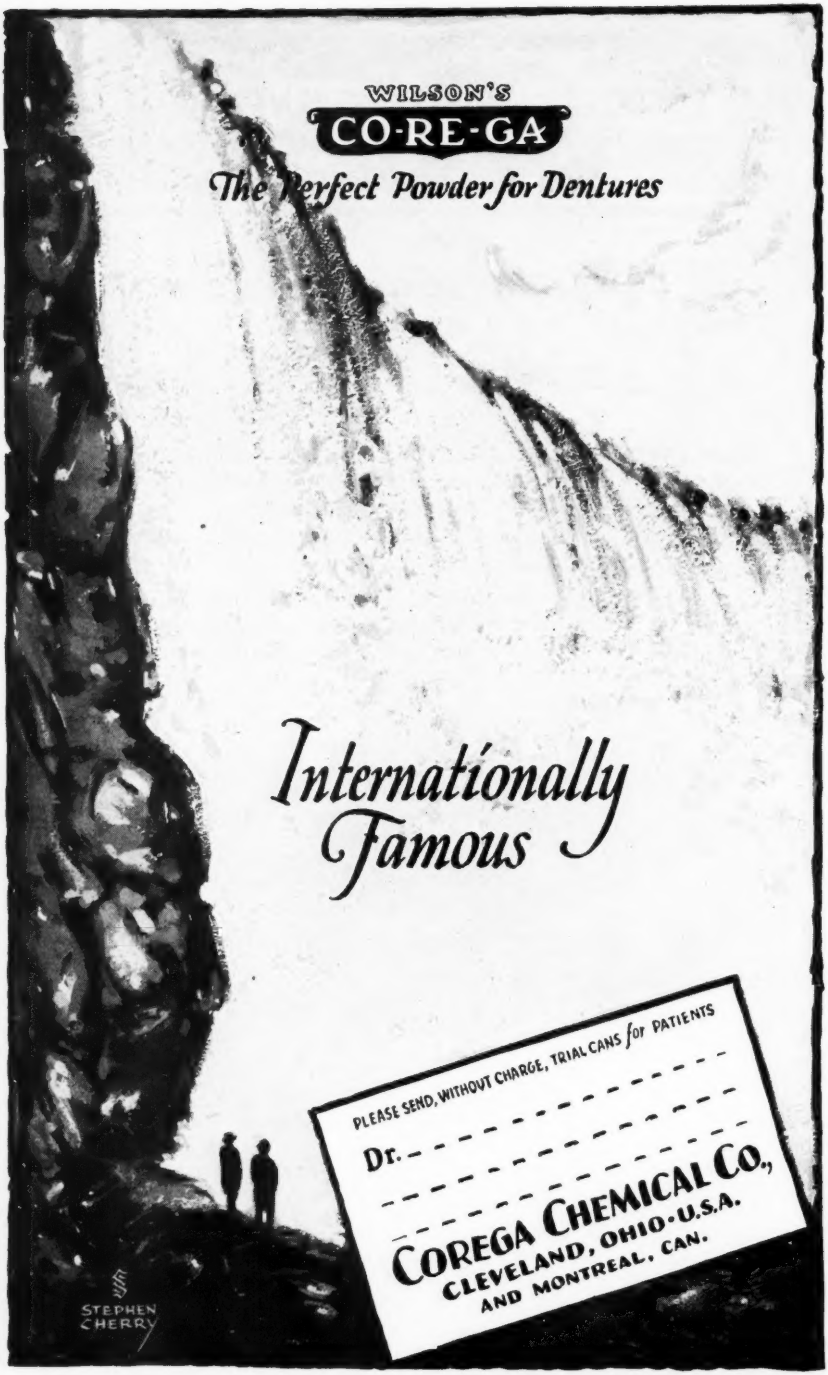
CHICAGO, ILL.
25 E. Washington St.

BOSTON, MASS.
120 Boylston St.

MONTREAL, CANADA
682 St. Catherine St., West

See Our Exhibit at the Chicago Clinic—January 13-15




WILSON'S
CO-RE-GA
The Perfect Powder for Dentures
Internationally Famous
PLEASE SEND, WITHOUT CHARGE, TRIAL CANS for PATIENTS
Dr. - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - -
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COREGA CHEMICAL CO.,
CLEVELAND, OHIO · U.S.A.
AND MONTREAL, CAN.
STEPHEN CHERRY

Kerr Perfection
Impression Compound Cakes

Kerr Perfection
Impression Compound Sticks

Greene-Kerr
Upper Impression and Bite Tray
with Removable Handle

Tracing Compound on to Rim of
Impression with Compound Stick

Test Impression taken in Kerr
Perfection Impression Compound,
showing Complete Muscle
Trimming

Your Patient Expects a SATISFACTORY DENTURE

Kerr Perfection Impression Compound will take an Impression that can be changed and tested until it fits accurately.

With a Tested Impression taken with Kerr Perfection Impression Compound, you can reproduce a denture that will be satisfactory to your patient.

By the Greene System of Impression Taking you will eliminate all the guess-work, and know by actual tests In Advance what the resultant outcome will be. Booklet giving this information sent on request. It's free!

Sold at All Leading Dental Depots

Detroit Dental Mfg. Co.

6081-6095 Twelfth St.

DETROIT, MICHIGAN, U. S. A.

Merry Christmas

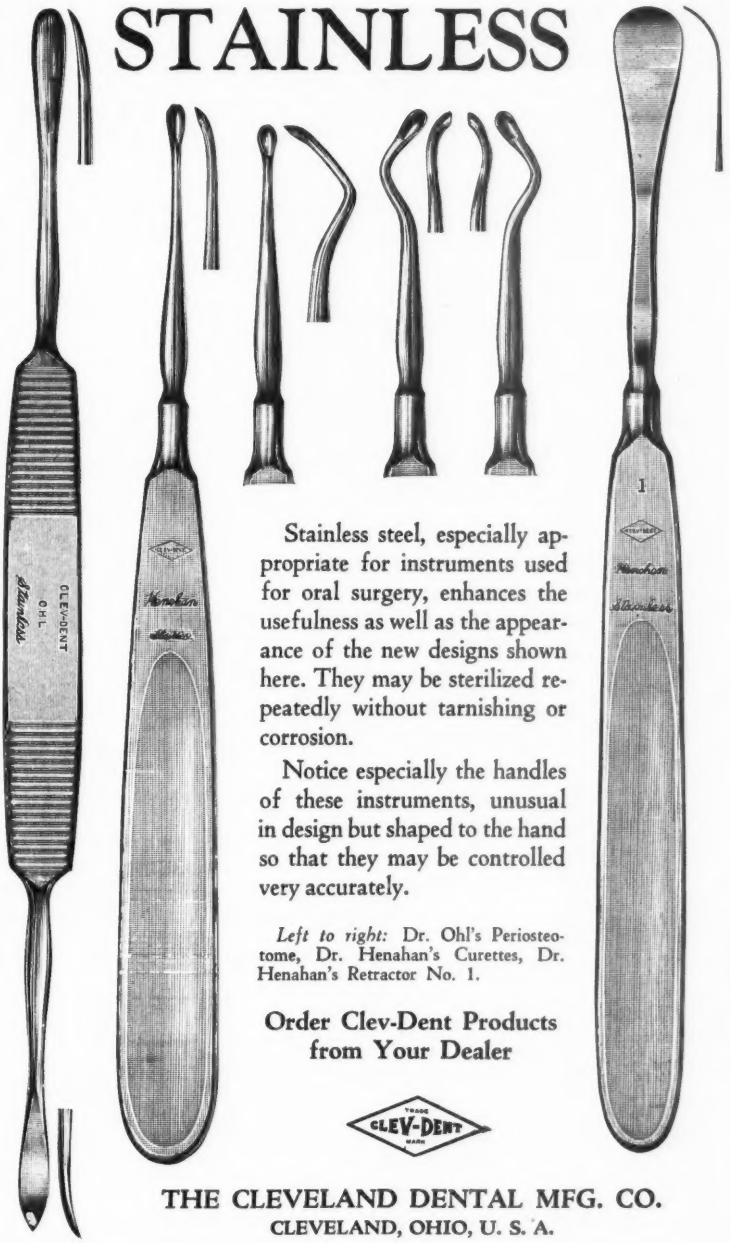
to Our Advertisers

AT this delightful season of the year when the sympathies and affections of the people are stirred as at no other time, we wish to extend our greetings to our advertisers for their loyal support during the past year, and to wish them continued prosperity and happiness for the year to come.

Cooperation is
the watchword of the hour.
We have greatly enjoyed the cooperation
of our advertisers, and we
bespeak its hearty continuance.

American Dental Association

STAINLESS



Stainless steel, especially appropriate for instruments used for oral surgery, enhances the usefulness as well as the appearance of the new designs shown here. They may be sterilized repeatedly without tarnishing or corrosion.

Notice especially the handles of these instruments, unusual in design but shaped to the hand so that they may be controlled very accurately.

Left to right: Dr. Ohl's Periosteotome, Dr. Henahan's Curettes, Dr. Henahan's Retractor No. 1.

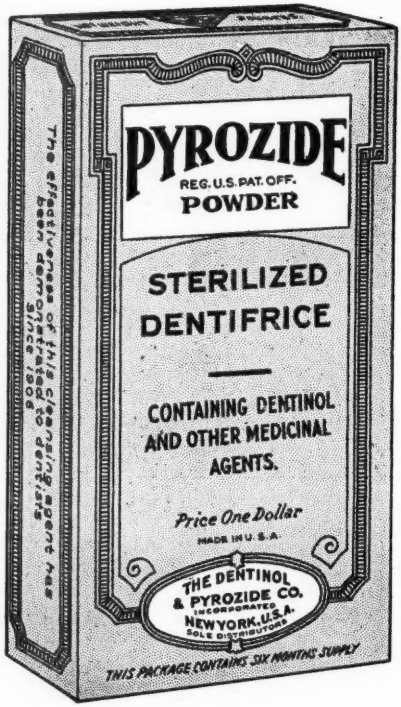
Order Clev-Dent Products from Your Dealer

TRADE CLEV-DENT MARK

THE CLEVELAND DENTAL MFG. CO.
CLEVELAND, OHIO, U. S. A.

DOUBLE DUTY

Polishes Teeth — Hardens Gums



Pyrozide Powder

stimulates circulation in impaired gum-tissue.

It hardens soft, spongy gums. It keeps them hard.

Gums that bleed easily when pressure is applied, respond to the action of this remedial dentifrice.

The efficiency of Pyrozide Powder is due, in part, to its Dentinol medication—a most effective gum-tissue healing agent.

Prescribe
PYROZIDE
POWDER
Compare Results

FREE SAMPLES COUPON

THE DENTINOL & PYROZIDE CO., *Sole Distributors* A. D.
1480 Broadway, New York, N. Y.

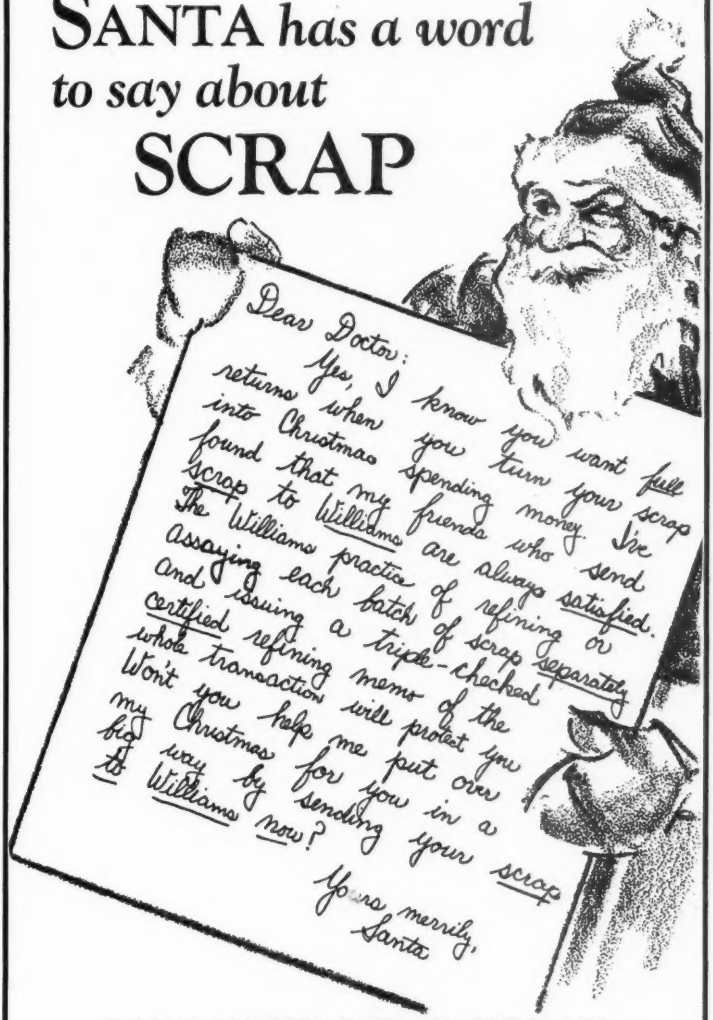
Please send FREE SAMPLES PYROZIDE POWDER for distribution to patients.

Name.....D.D.S.

Street.....

City and State.....

SANTA *has a word to say about* SCRAP


Dear Doctor:
Yes, I know you want full returns when you turn your scrap into Christmas spending money. I've found that my friends who send scrap to Williams are always satisfied. The Williams practice of refining or assaying each batch of scrap separately and issuing a triple-checked certified refining memo of the whole transaction will protect you. Won't you help me put over my Christmas for you in a big way by sending your scrap to Williams now?
Yours merrily,
Santa

MAIL YOUR SCRAP TODAY

Either direct or through your dealer

THE WILLIAMS GOLD REFINING CO., INC.

Dental Golds and Specialties

BUFFALO, NEW YORK

SAN FRANCISCO, CAL. BRIDGEBURG, ONT.

Nuform Teeth

What they mean to you as a dentist

LESS trouble! In setting them up, for they require less grinding (yet grind without chipping when grinding is necessary), articulate better and produce a good denture more easily than any teeth made.

Less trouble, too, with the finished case. Which is the result of their ability to give greater patient satisfaction over a longer period of time.

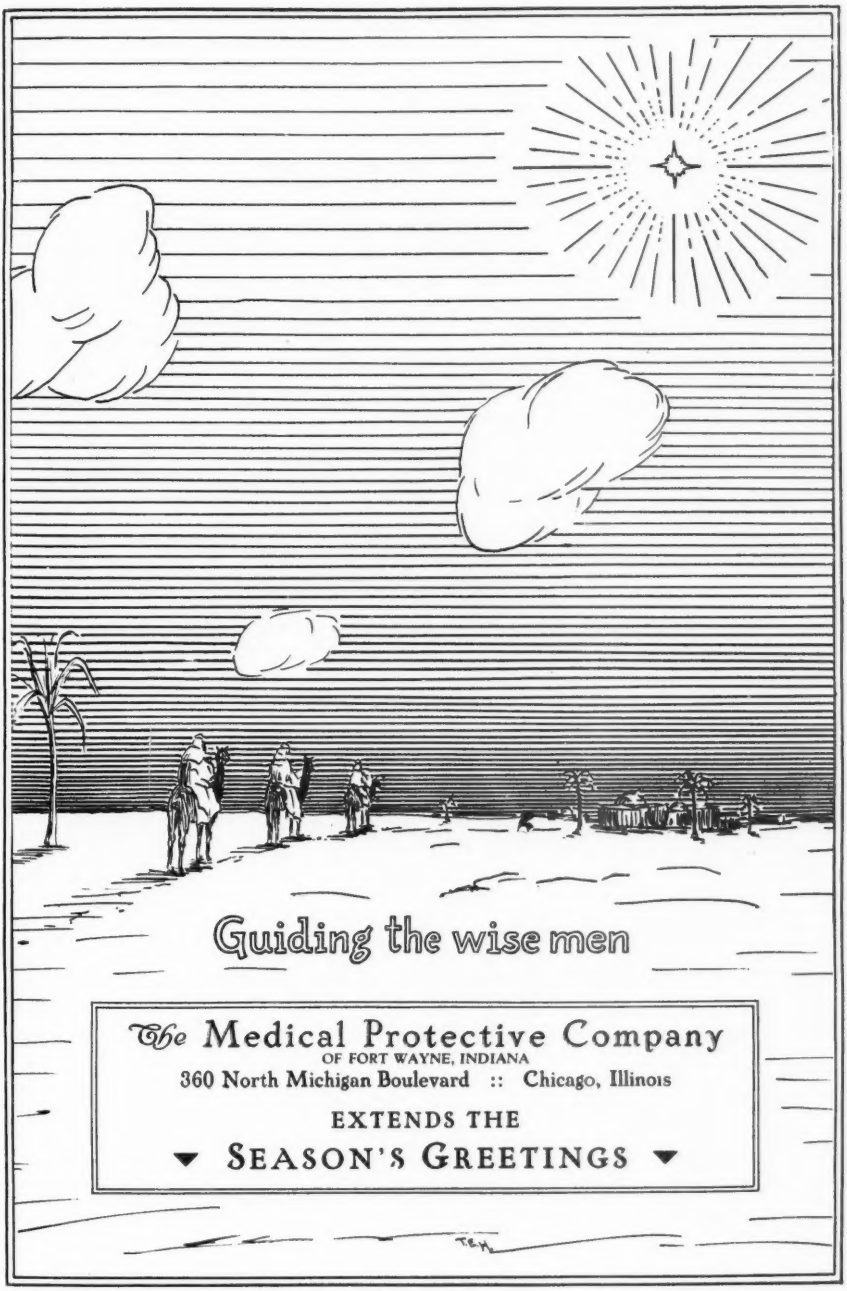
No one resorts to artificial teeth because they want to—but when it does become necessary, *they want the best.* Give Nuform a fair test. You'll agree they have absolutely no equal — for they are "as nearly perfect substitutes for natural teeth as it has yet been possible to make."

Write for a Universal Shade Guide and illustrated booklet on Nuform Tube Teeth.

Universal Dental Company

48th and Brown Streets

Philadelphia, Pa.


Guiding the wise men
The Medical Protective Company
OF FORT WAYNE, INDIANA
360 North Michigan Boulevard :: Chicago, Illinois
EXTENDS THE
SEASON'S GREETINGS

A DOUBLE RÔLE

In aiding the dentist, Iodent Tooth Paste plays an important double role.

Its content of easily soluble potassium and calcium iodides stimulates and builds up a firm, healthy gum structure; while the special characteristics and texture of the paste itself whiten and beautify—*with safety*— tobacco-stained and other hard-to-whiten teeth.

No. 1 For Teeth EASY to Whiten

IODENT

No. 2 For Teeth HARD to Whiten

TOOTH PASTES—TOOTH BRUSHES

IODENT CHEMICAL COMPANY

IODENT Building Lafayette Blvd., Detroit

Are You Getting What You Pay for?

JELENKO LINGUAL & PALATAL BARS

PATENTED

WHEN YOU BUY lingual and palatal bars, look for the "Kt." mark. "16" does not mean "16 Kt."

Jelenko Lingual and Palatal Bars are sold by Karat and each bar is plainly stamped "16 Kt."

Don't buy bars by the number "16." It means nothing. Order by Karat and look for the "Kt." mark.

Jelenko Bars have it.

There is a Jelenko Gold for Every Dental Need

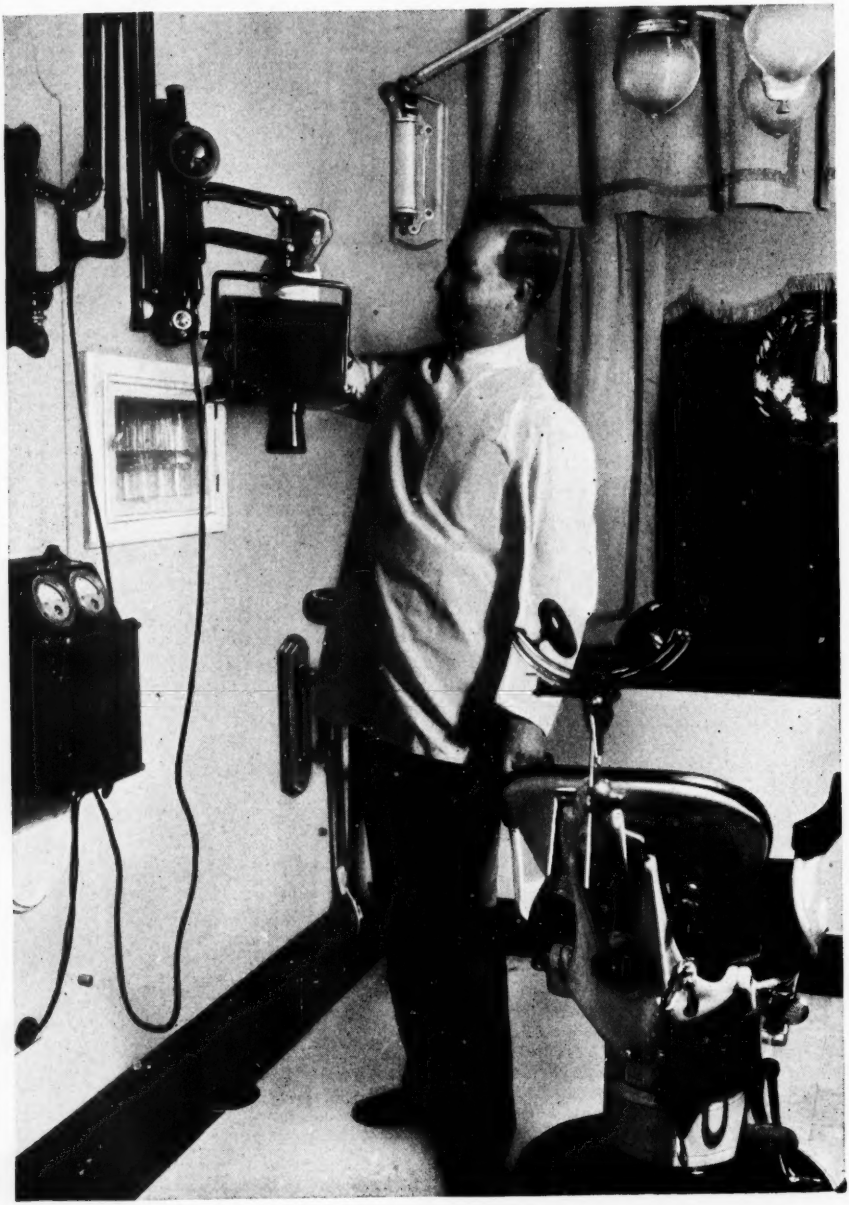
The Better Dealers sell Jelenko Lingual and Palatal Bars and other Jelenko products

OUR ILLUSTRATED BROCHURE SENT ON REQUEST

JELENKO GOLD

J. F. JELENKO & CO.
Manufacturers and Refiners of Dental Golds
136 West 52nd Street, New York, U. S. A

Why not this Christmas



Gift from You to You?..

A small down payment puts the Victor CDX in your office . . . convenient terms on the balance

A GIFT, Doctor, from you to yourself. From your personal self to your professional self, let's say. A Victor CDX that will make the year 1930 a better year for you professionally than any you've ever enjoyed. That will make you a better operator . . . able to improve your technique because of constant check-up of your work by means of this convenient all-seeing eye of modern science.

Don't you really owe it to yourself to own your own X-ray unit? There have been good reasons in the past why a dentist should send out for radiographs. But that was before this amazingly efficient and dependable Victor wall model was perfected. The Victor CDX has made roentgenology almost as simple as photography.

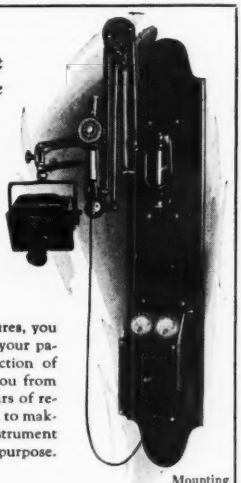
Dentists the country over have found that ownership of a CDX is a desirable investment in every way. Radiography promotes system, is indispensable in diagnosis, facilitates operations and gives information toward eliminating a large proportion of errors. It is human nature that you will make more frequent use of the X-ray if you have one in your own office.

A small down payment puts the CDX in your office. Then you have plenty of time to pay the balance. You'll find the CDX a good investment, just as your fellow practitioners all over the country have done. It pays for itself, as any number of dentists will tell you.

To learn all the facts about the Victor CDX will cost you nothing. Send us your name and office address for our booklet. Use the convenient coupon.

The X-ray that does not require floor space

The Victor CDX Dental X-Ray Unit is unlike any other. See how it is suspended from the wall. It is 100% electrically safe. Touch it anywhere with perfect confidence. In making radiographic exposures, you stand right beside your patient. The construction of the CDX protects you from stray radiation. Years of research were devoted to making this the finest instrument in the world for its purpose.



Mounting Panel Extra

VICTOR X-RAY CORPORATION

2012 Jackson Blvd., Chicago

A General Electric Organization

Dept. 126,
Victor X-Ray Corporation,
2012 W. Jackson Blvd.,
Chicago.

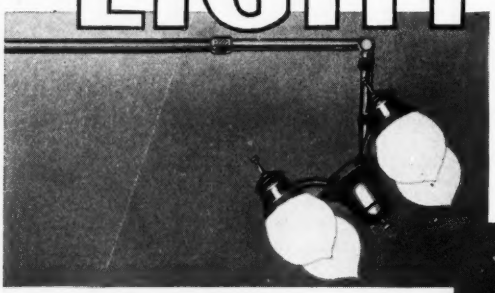
Please send me booklet and full information on the CDX.

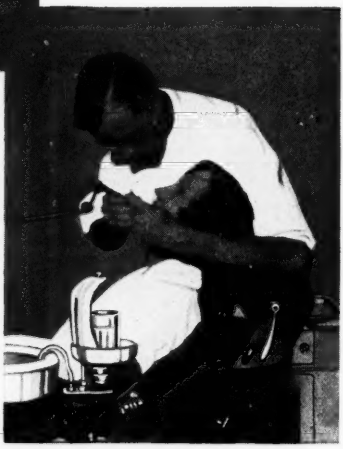
Name.....

Business Address.....

Dealer's Name.....

LIGHT without Shadow or Glare





THE PELTON EQUIPOISED OPERATING LIGHT

Designed specifically to prevent eye-strain, by furnishing illumination without shadow or glare . . . In the early stages of artificial light, ceiling fixtures and ordinary shades represented the sum of knowledge of what has since become the science of lighting . . . But eye-strain and other ailments were traced by scientists to improper lighting . . . As a result of these findings The Pelton Equipoised Operating Light was produced—eliminating the objectionable features of old style lights and furnishing diffused illumination which approximates nature's method as closely as human ingenuity will permit . . . It's the Light which definitely and conclusively banishes eye-strain from the category of ailments that have afflicted dentists to a greater degree than any other.

You preach and know the value of preventive measures — now is the time to apply them to yourself . . . Safeguard your health and your business.

SOME FEATURES WHICH PROVE PELTON SUPERIORITY

Four Holophane glass shades scientifically spaced . . . Mounted on a patented ball and socket joint . . . Two extension arms—telescoping . . . Shades ventilated — to permit heat to escape . . . Bulb Filaments adjustable—You can equalize the distribution of light at all times . . .

Ask your dealer to give you details of Pelton Equipoised Light — or write us direct for the information.

THE PELTON & CRANE COMPANY

DETROIT - MICHIGAN

Oral Prophylaxis and the Radio

How the Pepsodent Company is using America's most popular radio feature to carry dental education to the millions

ON August 19th the Pepsodent Company began a year's series of broadcasts which take place every night in the week except Tuesday. The feature is the blackface lives of radio's premier character artists, Amos 'n' Andy.

We hope that you and your family may find it as humorous and as entertaining as the many we have talked to. The station nearest you, and the time, are given below.

There is a serious side to this program, too, which has for its message the idea of oral prophylaxis. Each program, you will note, ends with the line: *Use Pepsodent twice a day, see your dentist at least twice a year.* It is our hope that the profession may benefit by this broadcast as well as Pepsodent.

Every evening (except Tuesday)—11 p. m. Eastern Time; 10 p. m. Central Time; 9 p. m. Mountain Time — through the following cities of the National Broadcasting Chain:

New York	Rochester	Chicago	Minneapolis
Boston	Cincinnati	St. Louis	Milwaukee
Springfield, Mass.	Pittsburgh	Kansas City	Superior, Wis.
Washington, D. C.	Detroit	St. Paul	Denver
			Salt Lake City

Sugar & the TEETH of Children

Sugar by itself does not affect the development and preservation of the teeth

THERE has been much prejudice against the use of sweets by children on the grounds of fear of decay of the teeth. Some kinds of candy collect around the teeth as do many other foodstuffs. The remedy is to keep the teeth clean—not to avoid the foodstuffs in question.

Sugar by itself does not affect the development and preservation of the teeth. The healthy development of the teeth depends upon the minerals and vitamins in the diet, and the sunshine which the child enjoys. In the variety of foods required by the child, a reasonable amount of sugar offers advantageous use. Sugar makes fruits, vegetables and cereals appetizing and attractive.

The craving for sweets is natural to the growing child. With the proper selection of foodstuffs, seasoned with sugar, this craving will be met. The bones and teeth will be properly formed. The muscles will be ruggedly developed and all the essential processes of nutrition will be maintained.

Added to a properly selected diet, no hygienic reason can be urged against the use of sugar by children, including candy at the end of a meal. Scientific reasons are, in fact, in favor of such use.

Guard the health of growing children through a variety of foods made palatable by sugar used as a flavorer. The Sugar Institute, 129 Front Street, New York City.

▼ ▼ ▼ ▼ Good Impressions

In this assortment of fifteen

ASH Impression Trays

YOU HAVE the secret of good impressions—correct anatomical designs and a tray for every type of case. Assortment contains Casco trays Nos. 1-9, comprising four sizes for upper edentulous; three for lower edentulous and two anatomical partial trays; also the popular Ash Box Partial Trays A. 1; A. 2; A. 3 (upper); C. 1; C. 2; C. 3 (lower).

Trays are of nickel silver—neatly arranged in a handsome cloth covered box. Price complete $15.00.

Other Trays as shown in Catalogue, may be substituted for those in standard set.

Write for the New Ash Catalogue

CLAUDIUS ASH, SONS & CO., U. S. A., Inc.

127-131 Coit Street -:- Irvington, New Jersey

Telephone Waverly 8510

Prescribe Lavoris For Your Denture Patients

The Lavoris Formula
Active Ingredients
in Grams Per Liter

Zinc Chloride	2.191
Menthol	0.382
Ol. Cinnam	1.486
Formalin	0.431
Saccharin	0.361
Ol. Caryoph	0.297

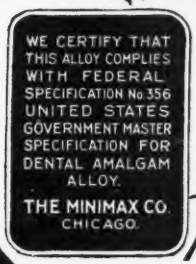
Alcohol 3%

In order to protect Lavoris and those who use it against inferior imitations, Lavoris is put out in sealed cartons only—in three sizes.

Preliminary to taking impressions, particularly after recent extractions, a few days course of Lavoris will contract gums and largely anticipate the usual gradual shrinkage that may later disturb the original perfect relation of denture to tissue. Following delivery of denture continue treatment for a few weeks. This will aid in insuring satisfactory functioning over a long period. The gums will be less yielding and sensitive and more resistant to stress of mastication. Lavoris Chemical Company, Minneapolis, Minn., Toronto, Ont.

LAVORIS

CERTIFIED QUALITY at LOW COST!


WE CERTIFY THAT THIS ALLOY COMPLIES WITH FEDERAL SPECIFICATION No. 356 UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR DENTAL AMALGAM ALLOY.
THE MINIMAX CO.
CHICAGO.

This Seal is Your Assurance of Quality

No amount of effort or skill in amalgam technique can overcome amalgam failures certain to occur with the employment of alloy of poor quality.

Compliance with Federal Specification No. 356, United States Master Specification for Dental Amalgam Alloy, is a dentist's greatest assurance of satisfactory physical properties in an alloy.

A dentist cannot overcome the deficiencies of an alloy of faulty manufacture.

To be sure of the quality of alloy you use, buy alloys that are certified to comply with Federal Specification No. 356.

The MINIMAX CO.

An organization of men specializing in the production of superior quality amalgam alloys.
Since 1905
7th Floor, Medical & Dental Arts Bldg.
CHICAGO, ILL.

In "The Survey of Amalgam Alloys: A Report to the Research Commission of the American Dental Association", by N. O. Taylor, Research Associate of the Bureau of Standards, it was found that only six alloys of 26 alloys tested complied with Federal Specification No. 356. Of the six, Minimax Alloy No. 178 was the only one to show no initial shrinkage, followed by a slight, desired expansion.

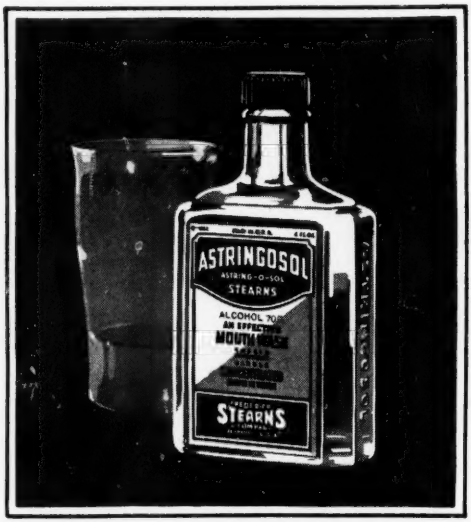
Minimax Alloy No. 178
still sells for
$1.42 per ounce.

10 ounces	$1.35
20 ounces	$1.28

Why Pay More?

WE DO NOT BUY OR REFINE AMALGAM SCRAP

FOR MOUTH AND THROAT



Dentists Everywhere Use and Recommend It

Dentists who are intent on giving their patients the best service, use and recommend Astring-o-sol after scaling, extractions, and other treatments. They also advise the use of Astring-o-sol for any soreness and discomfort that plates cause—for cleansing false teeth and plates—and as a daily mouth wash.

The constantly growing popularity of Astring-o-sol is due to these three vital superiorities: *(1) It does more—because concentrated. (2) It is more economical—because concentrated. (3) It tastes better—because it can be diluted to suit the taste.

Your patients will appreciate the benefits that Astring-o-sol gives. Recommend it to them as a daily mouth wash. It will help your work.

FREDERICK STEARNS & COMPANY

Manufacturing Pharmacists—*Established 1855*

Sydney, Australia DETROIT, U. S. A. Windsor, Canada

ASTRING-O-SOL

***CONCENTRATED FOR THREE REASONS**

ESTHETIC ~ PRACTICAL

Boos Construction
(Akers' Technic)

An ESTHETIC restoration is effected by the use of porcelain crowns which are a reproduction of the natural.

Maximum Cleanliness, and compatibility to tissue, much to be desired in denture construction, are assured in this gold partial replacement.

Our Certified Akers' technicians together with our extensive experience in dental prosthetics, assures you construction that is unexcelled.

SUGGESTIONS:

Grind the marginal ridges of abutment teeth to accommodate rest lugs. Send Solvite impression and shallow impression of the opposing arch, wax bite, and shade desired.

OUR CRAFTSMANSHIP ON AKERS' RESTORATIONS IS UNEXCELLED

HENRY P. BOOS
DENTAL LABORATORIES
~ MINNEAPOLIS ~

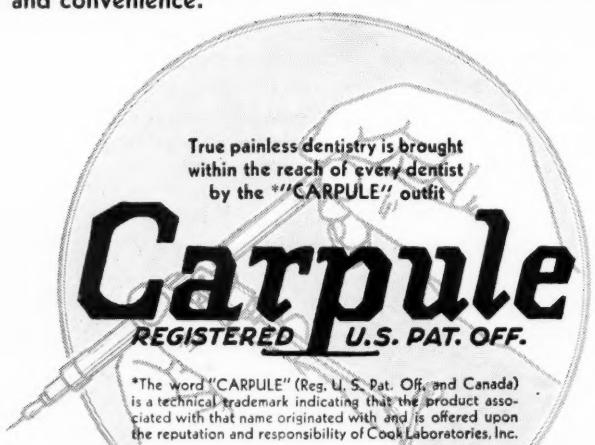
Cook Anesthetic Solutions

in *"CARPULE" cartridges are perfect in physical and chemical respects

Compounded according to standard formulas from the purest obtainable ingredients—with meticulous care and under rigid control—dosage, sterility and isotonicity in Cook anesthetic solutions are assured as much as uniformity, stability and absolute purity.

And the same painstaking accuracy prevails in the making of the *"CARPULE" cartridges themselves.

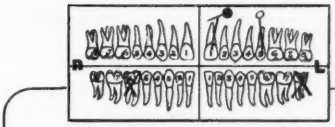
Thus *"CARPULE" cartridges—together with the speed, simplicity and safety of this unique equipment—present to oral surgeon and practitioner alike the utmost in service and convenience.


True painless dentistry is brought within the reach of every dentist by the *"CARPULE" outfit
Carpule
REGISTERED U.S. PAT. OFF.

*The word "CARPULE" (Reg. U. S. Pat. Off. and Canada) is a technical trademark indicating that the product associated with that name originated with and is offered upon the reputation and responsibility of Cook Laboratories, Inc.

COOK LABORATORIES, INC.

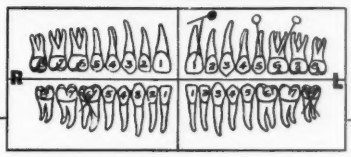
536 Lake Shore Drive • • • Chicago, Illinois



Record						
Patient	Appts	XR	Extr's	Fillings	Inlays	Crowns	Anesthesia
M.K.	1/10/29		6/18				Waite's Local
	1/10/29			L5	L1		" "
	1/20/29			Cavity Prep.	Cavity Prep.		" "
	1/26/29			15 Completed	11 Fabricated		" "
	1/27/29				1 Completed		" "

"Pain drives away

Your patients *unless* You drive away pain



Doctor!"

Record							
Patient	Appts	XR	Extr's	Fillings	Inlays	Crowns	Anesthesia
M.K.	1/16/29			L6			None Used
	1/0/29						
				Patient did not return			

...if you cannot make good your promise to your patients that "it will not hurt;"

...if you cannot prove to them that *all* dental intervention is painless;

your patients will desert you after you have done only the *indispensable* work.

But if you make local anesthesia the routine in all painful operations;

and you convince your patients that your chair means comfort, ease and pleasant work—

***then* Doctor!** *you will create a family of loyal patients and build a steady practice on a firm foundation.*

PAINLESS
DENTISTRY
Means
BETTER
DENTISTRY

Waite's

LOCAL ANESTHETIC
IN BOTTLES AMPULES CARTRIDGES*
Distinguished service since 1891

Made only by
The Antidolor Manufacturing Company, Inc.
Springville, Erie Co., N. Y., U. S. A.

***The sale and use of "Waite" Cartridges are licensed under patents owned by Cook Laboratories, Inc., Chicago, Ill.**

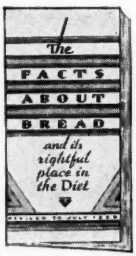
nutrition

NO ONE needs a more carefully selected choice of nutritious and healthful foods than the young mother. The fact that bread is almost always included in a nursing mother's diet is proof of its value.

The flour, milk, yeast and other ingredients of bread supply heat, energy and minerals in easily digestible form.

Bread is an essential part of every balanced diet along with meat, fruit, vegetables and dairy and poultry products for young and old. Bread and milk, bread and meat sandwiches, bread and butter and many other combinations make bread the greatest "carrier" of these other necessary items of the diet.

All the extensive scientific experiments have, according to our interpretation, proved that bread is a valuable food. Our modern white bread supplies energy-building carbohydrates and, made with milk and yeast and other ingredients, proteins of high quality. It furnishes many of the necessary minerals, and especially the much needed calcium and some of the vitamins. And, moreover, white bread is one of our most digestible foods, its food contents being quickly and easily absorbed by the body.



Send for
"FACTS ABOUT BREAD"

As one of the key people who direct the food habits of the nation, you are interested in knowing all "The Facts About Bread and Its Rightful Place in the Diet." Under this title we have published a book of authentic statements by eminent physicians, scientists and educators. We will be glad to send you without charge a copy of this booklet.

Know the FACTS *About Bread*

The above statement has been submitted to and approved by a group of disinterested and competent investigators in the field of nutrition, selected by the editor of The Journal of the American Medical Association. These investigators include Professors Graham Lusk, E. V. McCollum and Lafeyette B. Mendel.

{For complete information on nutrition see books written by these authorities}

COUPON

De-3129
Washburn Crosby Company,
Minneapolis, Minn.

Please send me, without charge, a copy of "The Facts About Bread and Its Rightful Place in the Diet."

Name.....

Address.....

City..... State.....

BREAD *IS* THE STAFF *of* LIFE

This advertisement and the booklet "The Facts About Bread and Its Rightful Place in the Diet" are published by Washburn Crosby Company, millers of Gold Medal Flour, to assist in broadcasting authoritative information about bread.

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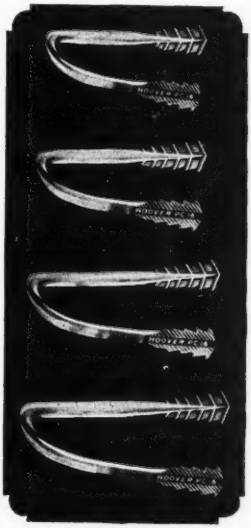
Lingual Bar Literature

YOU WILL WANT TO READ



IN ready-to-use Lingual Bars, the Hoover Standard Bar has three definite advantages which you will want to know.

We have prepared a new folder in color illustrating and briefly describing the advantages offered by Hoover Lingual Bars. The folder also contains prices.

For a copy of the "Hoover Lingual Bar" folder . . . simply attach the little "Memo" below to your card . . . and mail to us.

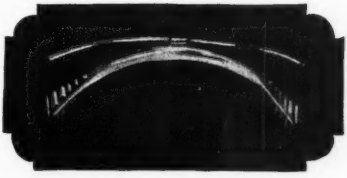
Hoover & Strong, Inc.

. . . METALLURGISTS . . .

119 West Tupper St., Buffalo, New York

Golden Rule Refiners and Manufacturers Since 1912. Dental Products of Character . . . Golds and gold products for every Dental requirement. Pryor Metal. Pryor Products. Hoover C. P. Mercury.

HOOVER STRESS BREAKING BAR



MEMO To HOOVER & STRONG, Inc.
119 West Tupper St., Buffalo, N. Y.

Without obligation, mail your new "Hoover Lingual Bar" folder.

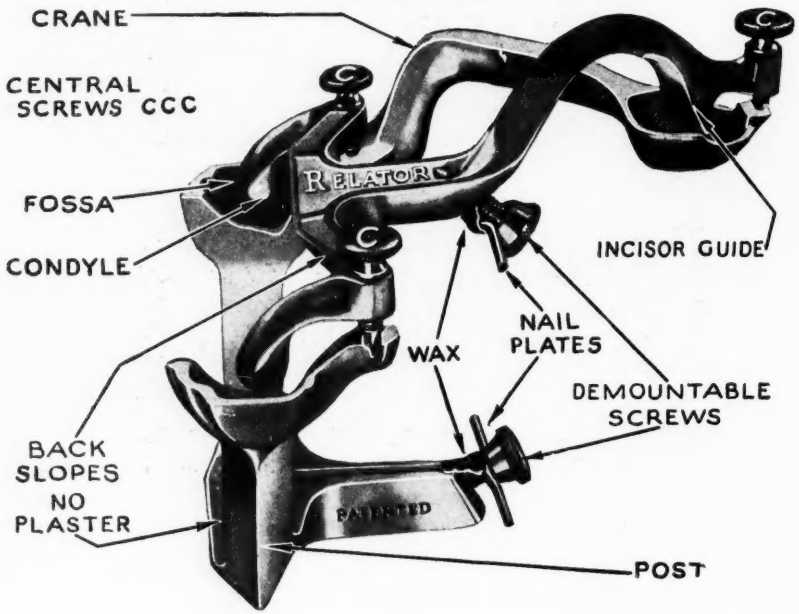
.....

A HOMER

RELATOR

TRADE MARK REG.

FOR ALL



OIL PARTS TOUCHING PLASTER

SCIENTIFIC DESCRIPTION:

Journal of the American Dental Association, January, 1928, page 134.
Journal of the American Dental Association, October, 1928, page 1928.
Journal of the American Dental Association, June, 1929, page 1047.

"Relators" can not be used to best advantage without special instruction. Teachers can be found in most of the principal cities of the world.

A Relator Is Essential in OCCLUSODONTIA

as taught by Dr. Joseph Homer

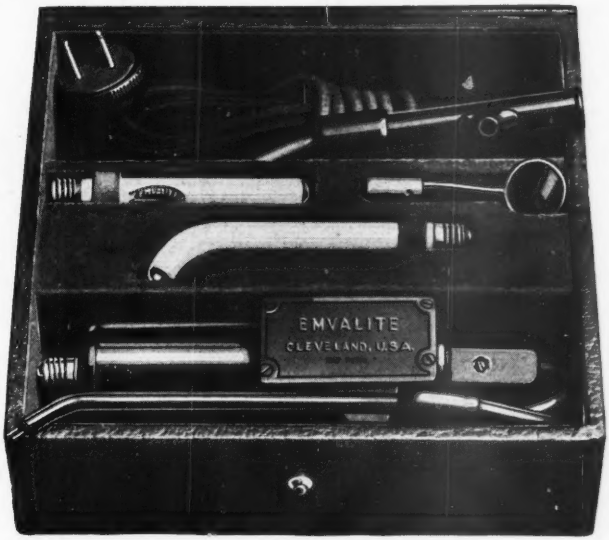
PRICE $50.00

Send check with order or a U. S. money order from foreign countries.

Outline of Dr. Homer's Post Graduate Course Sent on Request

HOMER DENTAL COMPANY
22 Central Park South, New York, N. Y.
Phone— Plaza 1740 or Wickersham 0818

Emvalite Complete Dental Diagnostic Set $45.00



NOW YOU CAN PURCHASE A COMPLETE DIAGNOSTIC SET FOR $45.00

Including: Pulp Vitality Tester, Curved Lamp for Transillumination, Straight Lamp with Mirror for Examination, Emvalite Cord and Socket. In a beautiful plush-lined leatherette case.

Requires No Rheostat or Transformer — Just Plug Into Any Light Socket.

The Emvalite Corporation, Cleveland, Ohio, offers this new, compact, small, unique Pulp Vitality Tester to the Dental Profession. Is an answer to the many requests for a positive means of a final check-up on X-Ray and Transillumination.

$22.50

To be used with your Emvalite or any other miniature low voltage socket. The shocking machine idea has been eliminated. Both electrodes are contained in one applicator and are hence applied to the tooth at one and the same time. Also to tell you the exact degree of life in the suspected tooth.

NO GLASS — NOTHING TO BREAK — MORE SATISFIED PATIENTS
MORE WORK — GREATER INCOME

Through your dealer or write us direct.

THE EMVALITE CORPORATION

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Sodiphene

TRADE MARK REGISTERED

Now You Can Believe In Signs

TIME was when the words "Antiseptic," "Germicide," etc., did not mean a great deal on a package. Those days are gone forever, thanks to the efforts of the Bureau of Chemistry, U. S. Department of Agriculture. In order to use either of these titles all preparations must meet certain bacteriological requirements specified by the Bureau of Chemistry.

SODIPHENE has the authority to so label its packages.

Besides being a dependable antiseptic, SODIPHENE has a remarkable healing action; also a slight analgesic effect which is both refreshing and reassuring to the patient.

Make sure that you and your patients benefit from the use of an antiseptic and germicide. You may learn more about SODIPHENE by sending in the coupon below. Prescribe it for your patients as it can be obtained from any drug store.

THE SODIPHENE COMPANY,
2531 Pennway, Kansas City, Mo.

Please send FREE professional package of SODIPHENE.

Dr.....

Address.....

Druggist.....

$3.00 Demonstrating Porcelain Jacket $3.00

This beautiful PORCELAIN JACKET made on a porcelain root will HELP YOU to show your patients the superiority of a PORCELAIN JACKET over any other type of crown.

It will HELP YOU to show your patients how and why it overcomes tissue irritation, or gum recession.

It will HELP YOU to show why the gum tissue around a PORCELAIN JACKET remains strong and healthy.

LAST BUT NOT LEAST

It will HELP YOU to SELL MORE PORCELAIN JACKETS.

We can furnish centrals and laterals in a plush-lined Leatherette case, as pictured to left, at $3.00 each.

USE THIS ORDER FORM

M. W. SCHNEIDER—DENTAL CERAMIC LABORATORY

35 East Wacker Drive, Chicago, Ill.

Enclosed find $3.00 or I will pay postman upon receipt of Jacket. If not satisfied, it is understood that I may return it within five days and you will refund my money.

Name.....

Street and No.....

City and State.....

Perfect Adaptation

THE Baker Swaging Process (*patent pending*) produces a denture plate so closely adapted that one would be justified in thinking the metal had been actually burnished over the model. ¶ No counter-die is used. Soft rubber discs are employed instead. Under the enormous pressure of fifty tons, developed by the Baker press, the soft rubber accommodates itself to every fine line present in the model. There are no wrinkles and it is never necessary to slit and solder the plate. The final swaging is done directly upon the stone model. ¶ We make our regular plate golds in disc form at no increase in price. A license to use the process goes with each disc. ¶ The price of the press, with all accessories is $175, f. o. b. Newark, N. J.

BAKER & CO., INC.
54 Austin St., Newark, N. J.

NEW YORK SAN FRANCISCO CHICAGO

Your Appearance Is a Barometer of *Your* Success!

Here is a special offering for the Dentist who believes that, aside from skill, personal cleanliness is the prime requisite to SUCCESS.

In White at Only $1.75 Per Garment

You can obtain this improved smock of durable White Twill. Its commendable features are that it is BUTTONLESS, that it has a DOUBLE-FRONT which permits either side to be reversed when one becomes soiled, that its BELTED STYLE makes it snug fitting on the tall man as well as on the short. To stimulate its distribution we are offering three of these garments for only $5.00.

Tan and Grey Also Available

(Color guaranteed if laundered without bleach)

For those who prefer colors to white, the same smock is offered in tan and grey at $2.25 per garment, or three for $6.45. But whatever color you want, just specify color in Style 4141, state your chest measurements and we will fill your order intelligently.

ANGELICA JACKET CO.

Since 1878

New York City	Chicago	St. Louis, Mo.
104 W. 48th St.	1238 N. Clark St.	1412 Olive St.
Dept. 12	Dept. 12	Dept. 12

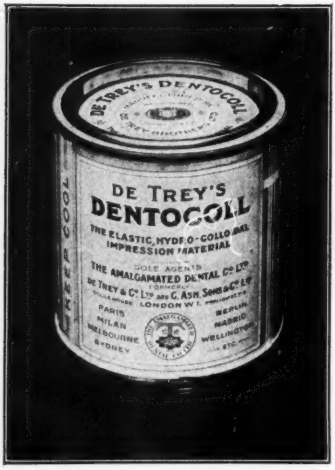
Mailing weight, 1 pound per garment. Please send postage.

WARNING

BEWARE OF FRAUDULENT SALESMEN! Don't pay deposits to anyone representing himself as a salesman or agent for Angelica Jacket Co. We have no salesmen authorized to collect money. If you pay anyone a deposit, you do so at your own risk.

Style No. 4141

START RIGHT



"NEAR ENOUGH" is never good enough—take your impressions with De Trey's DENTOCOLL, the "Elastic" Impression Material which has revolutionized the basis of prosthetic dentistry, and insure complete accuracy in the initial stage of denture construction or orthodontia work.

DE TREY'S

DENTOCOLL

(Patented in U. S. A.)

The "Elastic" Impression Material

For technical information on the use of Dentocoll Impression Material write to:
THE SECRETARY, DENTOCOLL INFORMATION BUREAU, SUITE No. 710, 475 FIFTH AVENUE, AT 41st STREET, NEW YORK CITY
Please give your dealer's name. Telephone Caledonia 6366

Demonstration from 9 o'clock to 4 o'clock daily or by appointment

IN
LIQUID
DIET

Horlick's *the Original* Malted Milk

solves the problem of a nourishing digestible food that is at the same time delicious and refreshing to your patients.

Natural and Chocolate flavors in glass jars—not in tins.

HORLICK'S MALTED MILK CORP.
RACINE, WIS.

American Dental Association

Addressing Service

The American Dental Association will furnish its list of members, arranged alphabtically by states, at the following rates:

$5.00 for the first one thousand (or less) names.

$4.00 for each one thousand (or less) names thereafter.

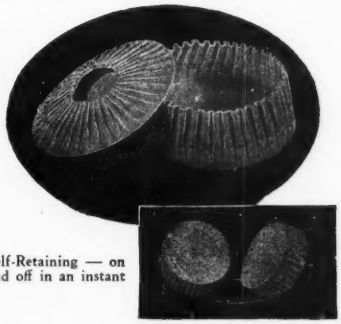
Envelopes or labels (which must be shipped prepaid direct to The American Dental Association, 58 East Washington St., Chicago, Illinois) will be addressed at the same rate.

We will also furnish any number of names desired, in any states that shall be designated.

All orders for this service must be mailed to our Chicago office.

American Dental Association
58 EAST WASHINGTON STREET
CHICAGO, ILLINOIS

J&J Sanitary Headrest Covers



Self-Retaining — on and off in an instant

Now in Universal Use....

A clean headrest for each patient. Progressive dentists everywhere have adopted these perfect covers for protecting the dental chair headrest.

Why waste your time with bulky towels or bother with other old makeshift ways of covering the headrest, when you can use perfect J & J covers for less than the cost of using towels? You will like J & J covers. And your patients, too, will appreciate them.

J & J Sanitary Headrest Covers are not only useful, they are also a distinctive refinement in your operating room.

If you have not tried these covers send for complimentary sample. Use the coupon.

Johnson & Johnson
NEW BRUNSWICK, N.J., U.S.A.

JOHNSON & JOHNSON
New Brunswick, N. J.

Send me free sample of your Sanitary Headrest Cover for chair checked below.

☐ New Style Ritter ☐ Old Style Ritter ☐ S. S. White ☐ Harvard

7

Dr...... *Address*.....

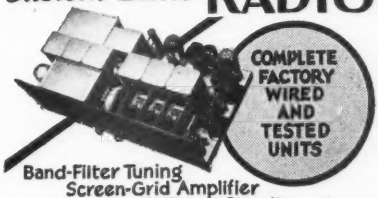
American Dental Association

Seventy-Second Session

DENVER, COLORADO

July 21, 22, 23, 24, 25
1930

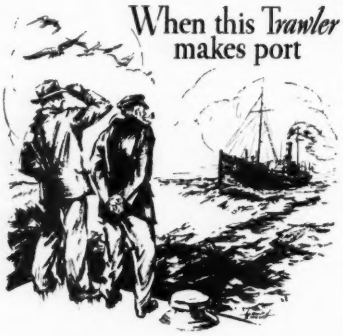
The World's Premier Custom-Built RADIO



Band-Filter Tuning
Screen-Grid Amplifier
Six Tuned Circuits
World-Wide Range

REGARDLESS of cost, no radio produced in mass can even approximate the skilled perfection of the new Custom-Built "HiQ-30." Here is the newest, most efficient model ever presented by Hammarlund—the climax of five years of unequalled custom designing and famed throughout the world for power, selectivity and tone. Assemble it yourself in two hours or we'll recommend a local custom-builder to do it for you. Choice of magnificent cabinets and speakers, $139.50 to $1,175 complete, less tubes.

Mail coupon for 48-page "HiQ-30" Manual



she brings fresh fish for the market and cod liver oil for *PATCH*, because she is one of the beam trawlers equipped with a Patch cooker, in which a Patch worker extracts the oil from the fish livers as they are caught—a floating Patch plant to insure the quality of your cod liver oil.

This method of extracting fresh cod liver oil, rich in the vitamins A and D, is a Patch patent and one of the developments poineered by Patch for the production of this modern, palatable, vitamin potent cod liver oil.

There is no substitute for cod liver oil, and Patch's Flavored Cod Liver Oil presents a product that is unusually palatable, standardized for vitamin A and D potency, and offers these vitamins in familiar dosage.

May we send you a sample bottle for a demonstration of its palatability?

Patch's

Flavored Cod Liver Oil

THE E. L. PATCH COMPANY
BOSTON, MASS.

THE E. L. PATCH CO.
Stoneham 80, Dept. ADA-12
Boston, Mass.

Gentlemen: Please send me a sample of Patch's Flavored Cod Liver Oil and literature.

Dr. .....

Address .....

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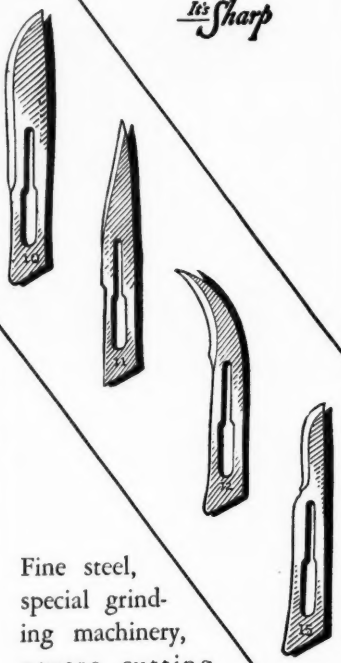
BARD-PARKER KNIFE

It's Sharp



Fine steel, special grinding machinery, severe cutting tests and relentless inspections make Bard-Parker blades razor sharp.

Bard-Parker Handles No. 3 —$1.00 each. No. 5—$1.50 each. Blades, all sizes, six of one size per package—$1.50 per dozen.

BARD-PARKER COMPANY, INC.
369 Lexington Avenue, New York, N.Y.

IN CHILDREN'S DENTISTRY

"During eight years of general practice, I was always a firm believer in the merit of Fleck's Red Copper Cement, always keeping and using where indicated with the best results. . . .

After giving up my general practice and limiting my practice to the field of Children's Dentistry, it became more and more prominent in my work until today *I cannot get along without it.* In deciduous teeth I have not found the equal of Fleck's Red Copper Cement and in preserving the newly erupted six year molars with the large fissures, it has proved its worth.

. . . *A Prominent Dentist of Pittsburgh, Pa.*

Name on Request

FLECKS RED COPPER CEMENT

Sold at All Depots

MIZZY, Inc., *Distributors,* New York

Every Dentist Knows the Importance of Oral Hygiene

EVERY dentist knows that decay of the teeth is retarded when the mouth is kept hygienically clean. Every dentist knows how much pleasanter it is to work in a mouth that had been cleansed and treated so that no unpleasant residues or odors exist.

Some dentists tell their patients to rinse their mouths with Dioxogen before and after treatment. Some of them recommend that their patients use Dioxogen regularly at home to keep their mouths prophylactic.

This practice is in line with the modern tendency of the dental and medical professions to teach prevention as well as to cure wrong conditions.

The
Oakland Chemical Company
59 Fourth Avenue
NEW YORK, N. Y.

Now

GREEN LINE

SPATULAS

of Stainless Steel

THE blades of the *New* Green Line Spatulas retain the same springiness, flexibility and life which, in the past, has brought such wide fame to their predecessors. The new blades, however, are of glittering, stainless steel. They'll retain their sparkling luster always and never again be shamed by violent contrast with the durable, handsomely finished handles.

Spatulas are made in five sizes and with flexible or stiff blades.

AND KNIVES

whose keen edges will delight you

KNIVES are made of finest *Carbon Steel.* NOT *stainless,* which lacks sufficient edge strength to survive plaster work.

BUFFALO DENTAL MANUFACTURING CO.

KEHR & URBAN STS., BUFFALO, N. Y.

Are You Moving?

If you don't want to miss a single copy of THE JOURNAL, send us your new address at the earliest possible moment. We are preparing for the most important issues of THE JOURNAL'S existence, and the Association's records must be correct if you are to be constantly advised of what the Association is doing, as well as read each month the splendid research and practical articles that are being published.

Date.....

AMERICAN DENTAL ASSOCIATION
58 E. Washington Street
Chicago, Illinois

Please send THE JOURNAL to me to the address given below, beginning

with the.....number.

Name.....

Street.....

City.....*State*.....

My old address as below is to be cancelled.

Name.....

Street.....

City.....*State*.....

I am a member of the..... State Society.

Classified Advertising Department

Advertisements under the following headings cost $2.00 not exceeding 30 words, additional words 10c each. This rate applies for each insertion.

Remittance must accompany classified ads.

—WANTED—		—FOR SALE—		
Apparatus	Location	Apparatus	Instruments	For Sale
Assistant	Partner	Books	Location	Exchange
Books	Situation	Furniture	Practice	Miscellaneous

An extra fee of 25c is charged advertisers who have answers sent care A. D. A., and in such case we do not furnish name or address to inquirers.

Forms Close on 1st of Month Preceding Month of Issue

FOR SALE---WANTED

YOUR CHANCE—Ethical practice established seventeen years. Reception room and furniture, completely equipped laboratory, operating room with New Model Wilkinson Chair, American Cabinet, S. S. White Spiral Flush Cuspidor, Overhead all cord suspension Ritter Engine, Bracket and Table, Light, Instruments, Forceps, etc., everything goes. All in perfect condition. Complete list of patients. $2,000.00 cash. Terms $1,000.00 cash, balance ten months. Seattle, Wash. Address N2297, care American Dental Association, 58 E. Washington St., Chicago, Ill.

FOR SALE—Transactions of the American Dental Association for the years 1912, 1913, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926 and 1927, at $1.00 per copy. As there are only a few available, orders will be filled as long as they last in the order in which they are received. Address A1449, care American Dental Association, 58 E. Washington St., Chicago, Ill.

FOR SALE—Lease and office with new modern equipment including X-Ray in David Whitney Building, Detroit. One of the highest grade clienteles in the city. Worthy of a high grade man. Address D2308, Care American Dental Association, 58 E. Washington St., Chicago, Ill.

SITUATIONS WANTED

WANTED—Situations for Class A dentists. We've a group of brainy experienced men qualified to head departments; others are interested in assistantships. All records have been investigated painstakingly. No charge is made to employers for the introduction of candidates. When you need a dentist for a temporary or permanent appointment communicate with The Medical Bureau, 1330 Pittsfield Building, Chicago.

WANTED—(a) Class A dentist, A.B. and M.D. degrees, desires assistantship, preferably in Ohio; year's experience; good diagnostician. (b) University of Pittsburgh graduate desires institutional or industrial appointment; age twenty-two; unmarried. 779, Medical Bureau, Pittsfield Building, Chicago.

WANTED—Class A Graduate desires teaching position; four years' dental experience which included some teaching; interested mainly in dental ceramics (publication A. D. A.) and prosthodontia; splendid experience in exodontia; licensed Maine and Massachusetts. 780, Medical Bureau, Pittsfield Building, Chicago.

Classified Advertising Department

POSITION DESIRED — Eastman School Graduate Hygienist, nine years experience, references, salary and commission or percentage. Licensed New York, Ohio, Tennessee and Louisiana. Address D2309, care American Dental Association, 58 E. Washington St., Chicago, Ill.

POSITIONS OPEN

WANTED—(a) High grade operator, one who is chiefly interested in operative dentistry; Massachusetts license desirable; excellently equipped and located office; open salary. (b) Recent graduate, unmarried, for Michigan institutional position; $1400; more if warranted; maintenance. 778, Medical Bureau, Pittsfield Building, Chicago.

WANTED—Dentist central Michigan town, fifteen thousand. Wonderful opportunity for right man's future. Lots of business. Situated main corner. Medical man has suite adjoining. Going strong. Irish and Polish people big element. Druggist will cooperate. Address D2311, care American Dental Association, 58 E. Washington St., Chicago.

POSITIONS OPEN — (a) Dakota institutional opening for single D. D. S. $125 month and full maintenance. (b) High class single Dentist wanted for lucrative South American appointment. Must have 5 years experience, be good mixer and dance well. No. E227 Aznoe's National Physicians' Exchange, 30 North Michigan, Chicago.

FOR RENT

OFFICE TO SHARE—Ethical. Entirely equipped. S. S. White unit and Victor X-Ray. Assistant in attendance. Must be seen to be appreciated. Very reasonable. Dr. Broder, 120 West 74th Street, New York City.

MISCELLANEOUS

WHAT DO YOU WANT? WE HAVE IT—We buy, sell and exchange used dental equipment. Western Metal Company, Bloomington, Illinois.

QUIZ COURSE FOR STATE BOARDS—We will conduct a correspondence and quiz course in preparaton for state boards, with special refeterence to the California Board. For full particulars, address Drs. Heaney and Wassman, Room 419-323 Geary Street, San Francisco, California. (N1692.)

PROFESSIONAL STATIONERY — "Neargravure" ("Neargravuremboso" plateless embossed) processes. Distinctive—Character. Special—Neargravure 250 white Bond envelopes. 8½x7¼" letterheads $3.33 or 8½x11" $4.44 cash, postpaid. Samples, prices. Solidays, ADA-124, Knox, Indiana.

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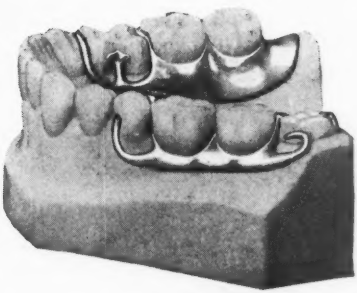

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